

# AI AUTOMOTIVE INDUSTRIES

**AUTOMOTIVE and AVIATION MANUFACTURING  
ENGINEERING • PRODUCTION • MANAGEMENT**

**AUGUST 1, 1955**

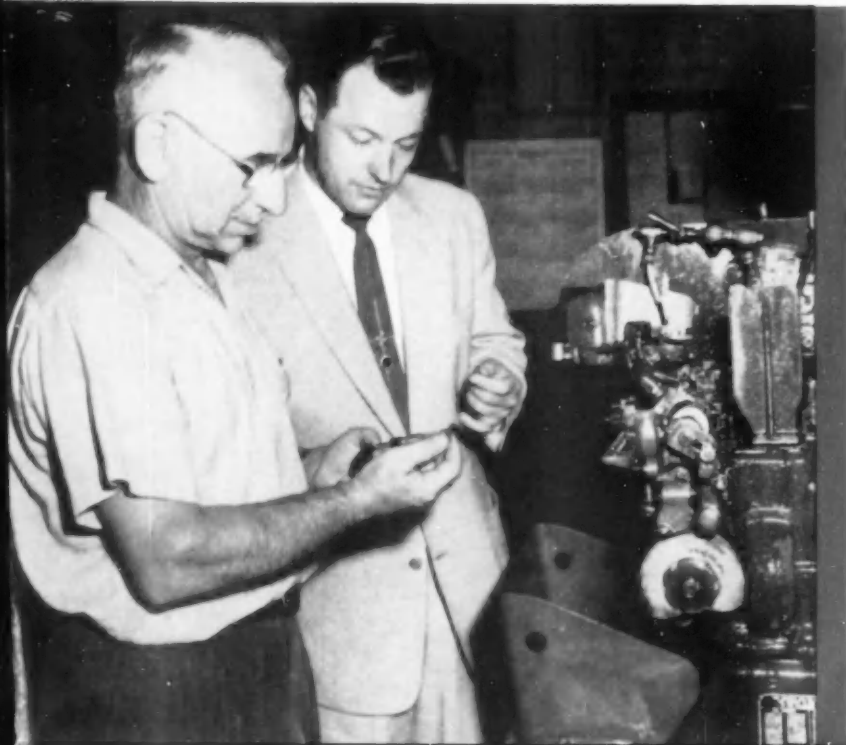
## ***In This Issue***

International Meeting on Aeronautical Research  
Aircooled Free-Piston Diesel Compressor  
Important Steps in Making Hollow Crankshafts  
Setting Up Big Machine Tool Show in Chicago  
Huge Supersonic Laboratory for Ramjet Testing  
Gear Production Lines That Are Fully Automatic

**COMPLETE TABLE OF CONTENTS, PAGE 3**

**A CHILTON PUBLICATION**

## ***The story of 5 benefits Wayne Screw Products*** **gets from using STANICUT CUTTING OIL**



Plant Foreman Al Ziegman (left) and Standard industrial lubrication specialist L. J. Loomis examine pitch diameter of screw threads. L. J. Loomis' engineering background plus his field experience in industrial lubrication, customers find, pays off for them. Lee is a graduate of Tri-State college of Indiana with a B.S. degree. Before entering field work, he completed Standard Sales Engineering School.

STANICUT Oil 137 BCS solved finish problem for Wayne Screw Products Company, gave better finish on screw and machined parts like these—plus four other important benefits.

Management at Wayne Screw Products Company, Detroit, found they were not getting a completely satisfactory finish on aircraft quality stainless steel, which the plant was machining. They followed a suggestion made by their Standard Oil lubrication specialist to switch to STANICUT Oil 137 BCS. The result: five benefits.

- 1 Better finish
- 2 Higher quality work
- 3 Longer tool life
- 4 Higher production because of less down time for tool sharpening and adjusting
- 5 Cutting oil costs reduced approximately 50%

At first STANICUT Oil 137 BCS was used in two automatic screw machines—a National Acme Multi-Spindle and a Brown & Sharpe Single Spindle. Production benefits prompted Wayne Screw Products to convert other equipment to STANICUT Oil 137 BCS—and with similar results.

Delivering benefits like this is an old story for STANICUT Oil 137 BCS. A Standard Oil lubrication specialist will be happy to demonstrate how Standard's cutting oils can perform with similar results for you. In the Midwest, a call to your nearby Standard Oil office will bring a prompt response. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



**STANDARD OIL COMPANY**  
(Indiana)

# "Back-up" power for straddle carrier torque converter drive



Courtesy — Iowa Manufacturing Company  
Cedar Rapids, Iowa

## ...through "engineered-to-order" COTTA TRANSMISSION

Cotta's Model TST Transmission, especially designed for trucks and heavy-duty mobile equipment driven by torque converters, provides forward and reverse gears for this Gerlinger Model SC50 Straddle Carrier — a boon to materials handling in rolling mills and steel plants!

This vehicle can quickly pick up heavy billets and bar stock, carry them at speeds up to 25 mph on smooth terrain, and unload in a matter of seconds! The torque converter transmission eliminates operator fatigue and provides a smooth flow of power through a wide range of torque and speed conditions. Uninterrupted, *low-maintenance* operation is assured, too, because the Cotta Transmission is designed especially for reversing applications behind torque converters . . . to serve the heavy-duty power requirements of big equipment.

If you build rail cars, winches, drilling rigs, trucks, hoists, or other heavy-duty mobile equipment, and are considering the application of torque converter drives, Cotta will build an "engineered-to-order" transmission to meet your specifications — a unit that will stand up under severe operating conditions for the life of your equipment.

### THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions, and complete specifications sent free on request. Just state your problem—COTTA engineers will help you select the right unit for best performance. May we work with you?

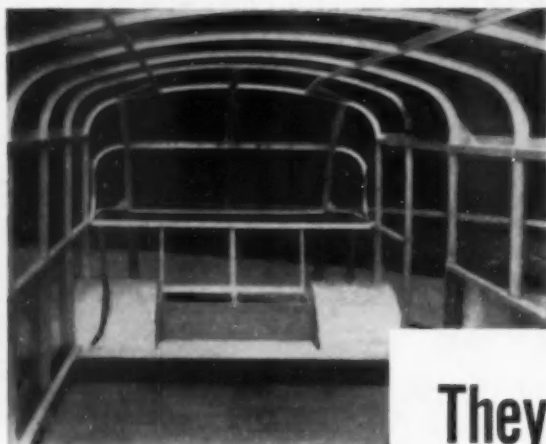
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



# COTTA

HEAVY-DUTY  
TRANSMISSIONS

"Engineered-to-order"



1300-pound weight saving means less wear on tires and brakes, less fuel and maintenance for this 25-passenger type bus body made by Boyertown Auto Body Works, Boyertown, Pa.



## They Haul more...yet weigh less

Resistant to corrosion, abrasion and impact, nickel alloy steels extend life of 17 basic bodies and more than 100 custom variations put out by Boyertown Auto Body Works.



50% greater yield strength in sections of  $\frac{3}{4}$ " or less, and up to 40% more ultimate strength permit Boyertown to trim about 500 pounds from this type of parcel delivery truck, as compared with carbon steel.



The interior of Boyertown's food-handling trucks is lined with stainless chromium-nickel steel for its corrosion-resistance which assures sanitation.

You, too, can trim needless weight from truck bodies, while adding strength, toughness and corrosion-resistance

Use of high strength, low alloy steels containing nickel is the answer

You can lower haulage costs by designing to utilize high strength, low alloy steels containing nickel.

Several leading steel companies offer these steels. Look for such trade names as Tri-Ten, Cor-Ten, Mayari R, Yeloy, Hi-Steel, Double-Strength, and Dynalloy.

Get all the facts shown in "Nickel-Copper High Strength, Low-Alloy Steels..." a manual that is yours for the asking.

It discusses design factors that help

you cut weight without sacrificing safety. It explains why these nickel alloy steels provide superior resistance to atmospheric and many other types of corrosion. It describes their behavior in fabrication, as well as applications that illustrate how they may help you improve products or equipment.

Take full advantage of the properties these nickel alloy steels offer... write for your copy of "Nickel-Copper High Strength, Low-Alloy Steels" now.



# THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

# AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE

PUBLISHED SEMI-MONTHLY

AUGUST 1, 1955

VOL. 113, NO. 3

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• Cleveland OOD double reduction type speed reducer installed on a Microgrinder. Photo courtesy Curtin-Harbert Co., Inc., Gloversville, N. Y.

## CLEVELAND-driven grinder sands to .001"

**T**HIS highly accurate Microgrinder is used to sand wide webbed material to extremely close tolerances. In some production jobs it sands to plus or minus .0005". Such precision work demands dependable, uniform power transmission—and a Cleveland double reduction worm gear speed reducer has a vital part of the job.

The abrasive-wrapped cylinder is driven by a 20 hp motor. A belt drive runs from the cylinder to the Cleveland speed reducer, and the back-up roll is chain driven from the reducer. The extended intermediate shaft drives a ball bearing eccentric which oscillates the cylinder.

Clevelands fit perfectly into complex power transmission jobs. They're compact—right angle construction of a worm gear drive saves space. High shock load resistance and efficient performance are inherent. Parts are reduced to a minimum, reducing maintenance. Torque flow is smooth and uninterrupted. The case-hardened steel worm and nickel-bronze gear actually improve with use.

Wherever you have a power transmission need or problem, simple or complex, find out how a Cleveland speed reducer can handle it dependably and economically. Send for Catalog 400 today. The Cleveland Worm and Gear Company, 3274 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.



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Worm Gear  
*Drives*

For **LARGE HOLES**  
in **TOUGH METALS**  
you need a . . .

# BAUSH HEAVY DUTY DRILL

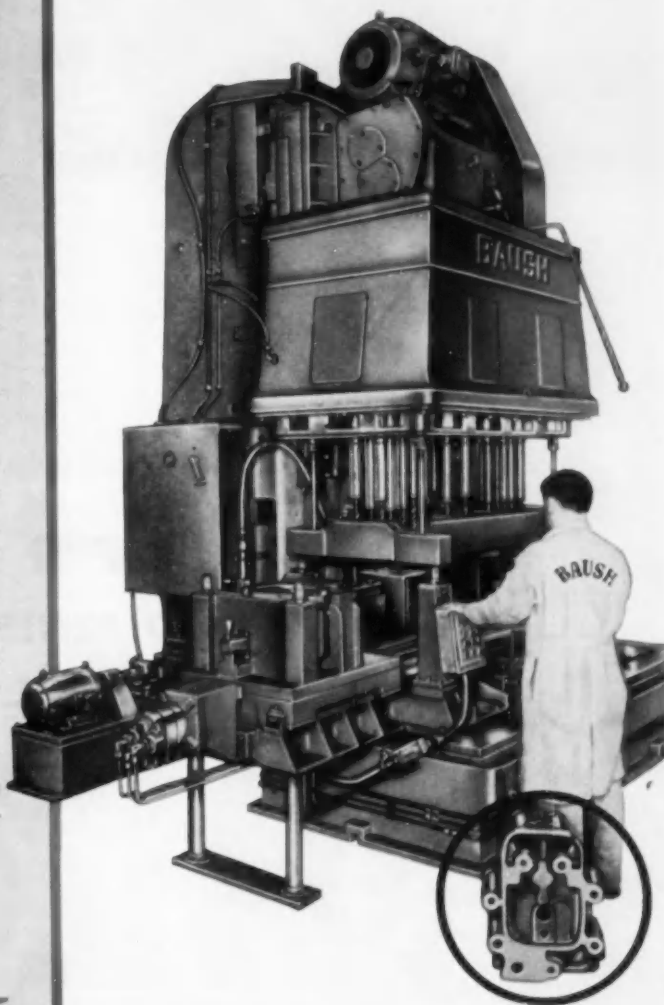
. . . just as one large engine maker has selected the Baush Vertical W8 Hydraulic Multi-Spindle Drill illustrated for drilling, core drilling and reaming heavy diesel motor cylinder heads.

The experience and know-how of Baush, gained through more than 60 years of building equipment with a reputation for sturdiness, long life and extremely low "down time," is exemplified in such a unit.

Designed to operate with a 4-position sliding fixture this machine drills 16 holes from  $21/32$ " dia. to  $1\frac{1}{2}$ " dia., as well as core drilling 12 holes from  $1-5/32$ " to  $1\frac{1}{2}$ " dia. and reaming 2 holes to .871; making a total of 30 slip-sleeve spindles with nose adjustment incorporated in a special head  $28$ " x  $54$ " of the adjustable joint driven type, with master bored cluster plate.

30 H.P. 1800 R.P.M. spindle motor arranged for Texrope drive furnishes drilling power and a  $7\frac{1}{2}$ " H.P. 1800 R.P.M. motor drives hydraulic pump.

**B**  
**BAUSH**  
**MACHINE TOOL CO.**  
SPRINGFIELD 7, MASSACHUSETTS



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**THE  
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SHOW**

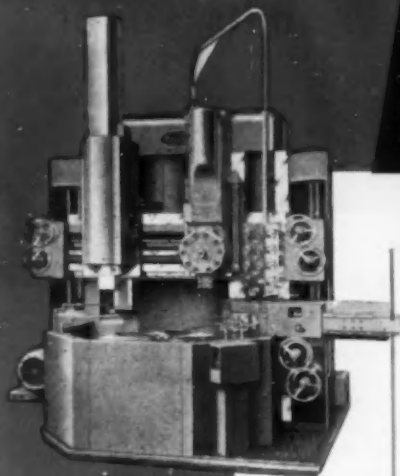
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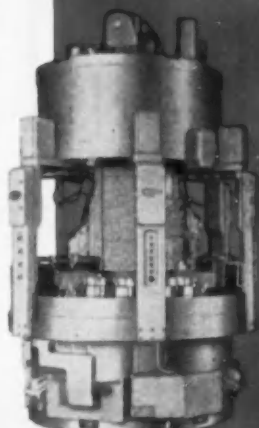
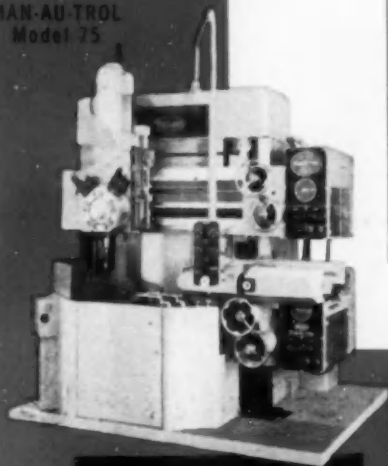


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Machine Tools  
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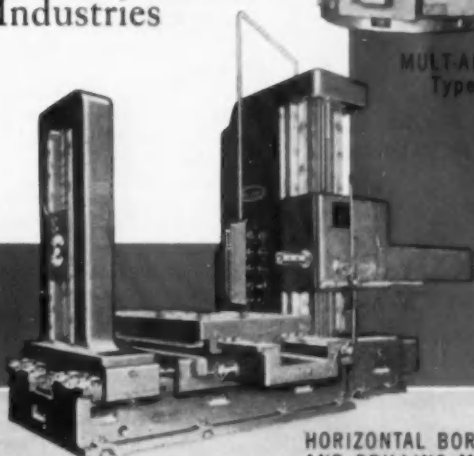


**CUT MASTER  
V.T.L.  
Model 75**

**MAN-AU-TROL  
Model 75**



**MULT-AU-MATIC  
Type "L"**



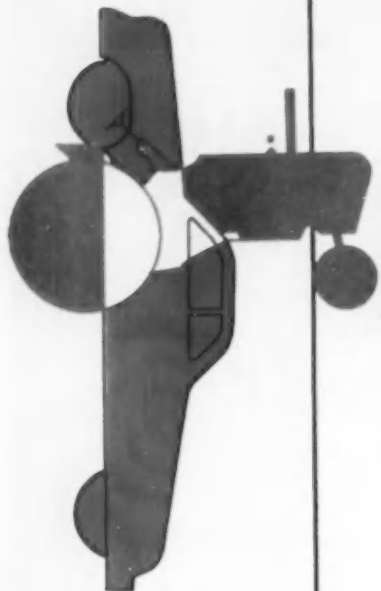
**HORIZONTAL BORING, MILLING  
AND DRILLING MACHINE**

**Model 75**



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## PEARLITIC CASTING permits wider

# FREEDOM OF DESIGN

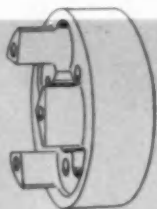
Albion's *pearlitic* malleable irons can be cast to your specifications with physical properties to suit your specific range of applications. For only *pearlitic* malleable irons combine the advantages of both castings and forgings and can be produced to extremely close dimensions, in large quantities, with greater freedom of design and at lower cost. Albion's complete manufacturing facilities provide the rigid metallurgical control through all phases of production to guarantee more uniform quality in the finished casting.

Contact your Albion Malleable Iron Company representative now, and see for yourself how many ways Albion's *pearlitic* irons can save you time, tools and dollars.



### ECONOMY

Albion's *pearlitic* malleable irons offer complete freedom of design for greater savings in machining time, the elimination of excess metal and lower finished part cost.



### PERFORMANCE

Albion's *pearlitic* malleable irons afford unusually fine wear resistance with excellent bearing properties. Maximum rigidity and prolonged fatigue life offers outstanding endurance. Yield strength comparable to steel forgings plus good damping capacity.



### QUALITY

Albion's *pearlitic* malleable irons have a fine, uniform grain structure that machines easily and accurately with exceptional mirror-smooth finishing qualities. Extremely adaptable to localized hardening for specific needs.



*Laboratory Service*...whether you are designing new products or reviewing present production, Albion's Research and Development Laboratory facilities and competent engineering staff are ready to help you design better products that can be made at lower cost.

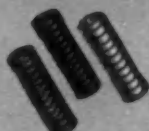


## ALBION MALLEABLE IRON CO.

Albion, Michigan



PRECISION  
DOWEL PINS  
(Standard  
or Oversize)



DIE  
SPRINGS  
(3 Pressure Ratings)



SOCKET, BUTTON OR  
FLAT HEAD  
CAP SCREWS



STRIPPER  
BOLTS



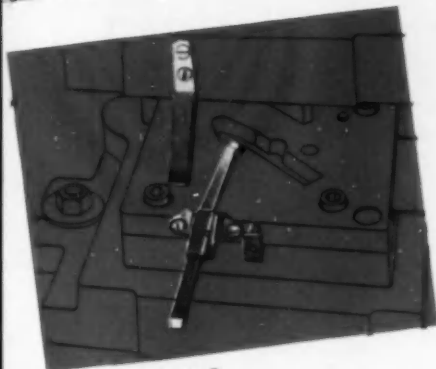
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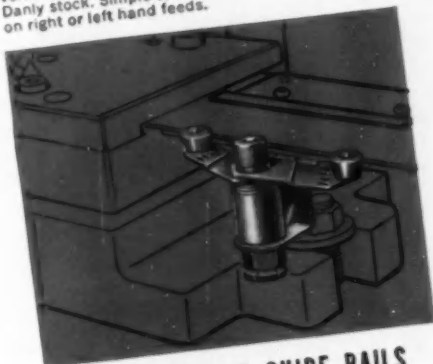


TOGGLE  
CLAMPS



### NEW DIE STOP

Built for dependable action, Danly primary and universal automatic stops can be ordered direct from Danly stock. Simple to attach, they can be mounted on right or left hand feeds.



### NEW GUIDES AND GUIDE RAILS

Low cost, rugged, easy to install, this new addition to the Danly line is used on dies or in any operation where coil and strip stock must be guided. Hardened parts assure long wear. Packaged complete with mounting screws and dowels.

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DRY SEAL  
PIPE PLUGS



AUTO-  
GAGES



PUNCH  
SHANKS



PRY  
BARS



HOLLOW  
SET SCREWS

# Here's Your Answer To High Production Turning:

**1 Sundstrand "Engineered Production" Using...**

**2 Sundstrand Automatic Lathes Plus...**

**3 Automatic Handling**

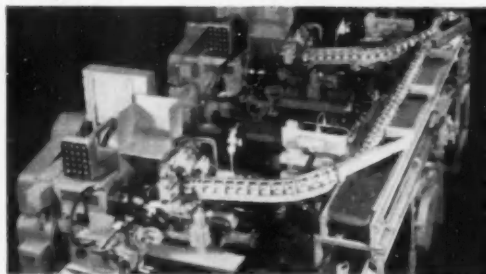


Sundstrand "Engineered Production" means designing and building machinery for the job at hand while using all the skill and advanced facilities available. For instance, here are seven interesting lathe installations, each of which is provided with automatic work handling coupled with automatic machine cycling . . .



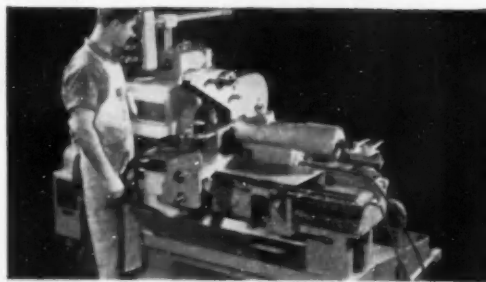
**Turning, Handling and Gaging Automatically**

Automatic handling, machining and gaging of stator cores is performed on this Sundstrand Lathe. Parts are fed in by gravity, automatically loaded, turned, chamfered, gaged and ejected. Gaging is interlocked with automatic tool advancement of .0005". After 5 settings, the machine stops automatically for tool changes. Production is 154 parts per hour.



**Turning, Facing, Chamfering and Grooving 376 Pistons Per Hour**

Continuous automatic cutting cycles of these two Sundstrand Lathes combine with automatic loading, unloading and conveyance of parts for a high degree of automation in machining automobile pistons. Each machine turns, faces, chamfers and grooves for a total production of 376 pistons per hour.



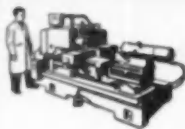
**Turning with Hopper Loading**

Spacer tubes are turned on this Model 6A Lathe. Everything is done in automatic programmed sequence from gravity hopper feed loading (above the turning operations) to final ejection of work to unloading chute below. Production reaches 136 parts of steel and 68 of titanium per hour.



50 YEARS OF  
**"Engineered  
Production"  
Service**  
MADE IN U.S.A. AND CAN.

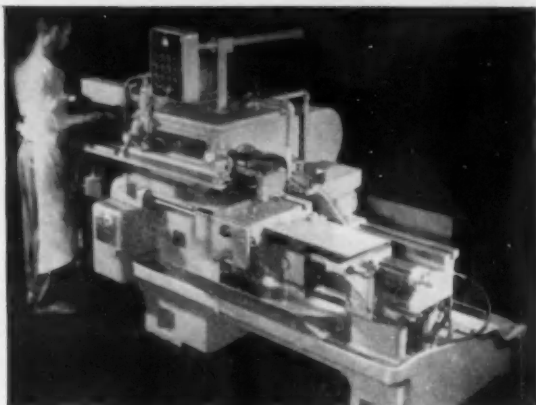
AUTOMATIC LATHES | SIMPLEX RIGIDMILLS | DUPLEX RIGIDMILLS





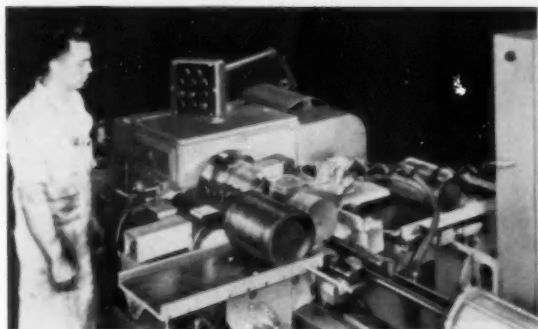
### Facing and Chamfering Both Ends of 240 Stator Shells Per Hour

Facing and chamfering both ends of stator shells is done by automation of this Model 6A Automatic Lathe. A finger picks a part from the inclined loading chute and positions it for spindle loading. The part is machined on both ends simultaneously and then ejected into the unloading chute.



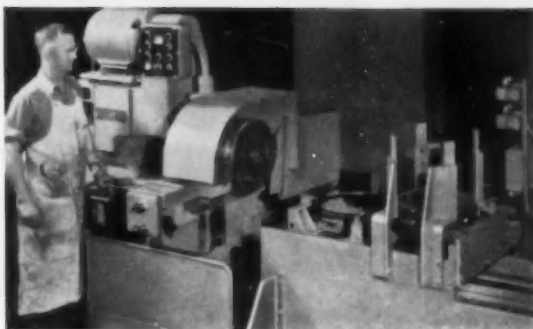
### Hopper Loading Through Spindle

This example, a steering actuator screw, lends itself to a different type of automation. Here the work, coming from a gravity feed hopper is pushed through the spindle at the back to a positive stop and clamped for turning and grooving the end. After the cut, the part is automatically released and pushed into the unloading chute by another incoming part. Production is 240 pieces per hour.



### Turning Diesel Engine Pistons

Several different models and sizes of diesel engine pistons are turned by automation of a Sundstrand Model 8A Lathe. The part is released from the loading chute, pushed on the driver, turned, grooved and faced, then pulled off the driver and released into the unloading chute.



### Turning 165 Ring Gears Per Hour

Here, automation is provided for loading and ejection of fly-wheel ring gears. The shuttle loader picks up a part from the magazine, moves forward, swings up 90° to place part into the clamps and returns for another part during the cutting cycle. After the cut, the clamps release allowing the part to roll down the unloading chute.

### Free Data

Additional information is available on the complete line of Sundstrand Automatic Lathes for small lot, long run or special turning jobs. Ask for bulletin 258.



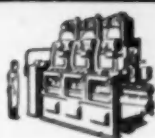
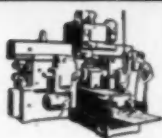
BOOTH

1412



TRIPLEX RIGIDMILLS

SPECIAL MACHINES

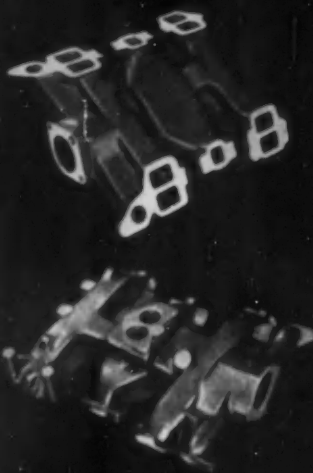
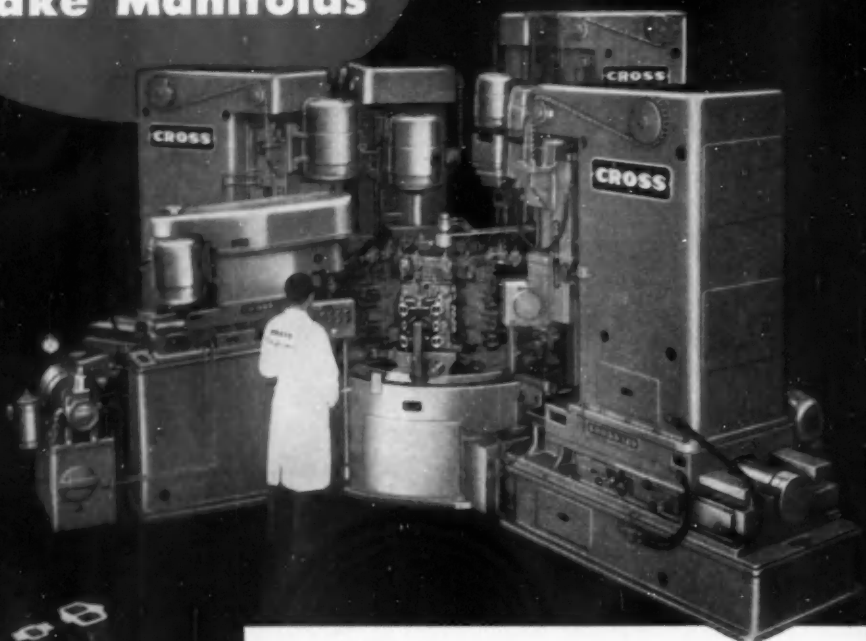


**SUNDSTRAND**  
**Machine Tool Co.**

2571 Eleventh St. • Rockford, Ill., U.S.A.

# Mills and Drills 2 and 4 Barrel Intake Manifolds

*Another Special by Cross*



- ★ Rough and finish mills mounting faces; mills, drills and chamfers water outlet pad.
- ★ 145 pieces per hour at 100% efficiency.
- ★ 7 stations: 1 loading, 4 milling, 1 drilling and 1 chamfering.
- ★ Hydraulic power clamping for work holding fixtures.
- ★ Automatic retraction for milling cutters.
- ★ Cross-Drive for milling cutters.
- ★ Pre-set tooling throughout.
- ★ Gravity operated cam clamping for indexing table.
- ★ Other features: Hardened and ground ways; hydraulic feed and rapid traverse; complete interchangeability of all standard and special parts for easy maintenance; Construction to J.I.C. standards.

See us in Booth No. 1118 at the Machine Tool Show

Established 1898

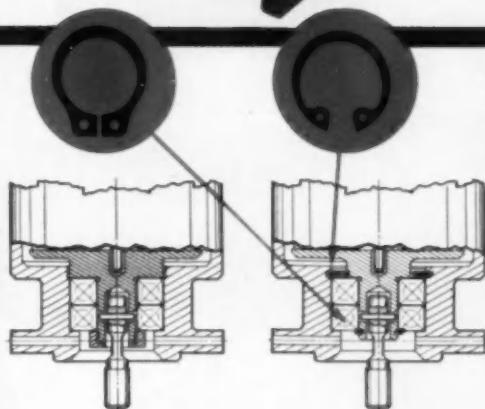
THE **CROSS** CO.  
DETROIT 7, MICHIGAN  
*Special* MACHINE TOOLS

## 10 Waldes Truarc rings speed assembly— Eliminate parts and machining in precision control



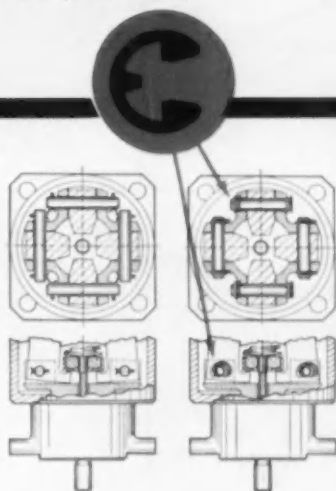
### Kahn Rotary Speed Control

Kahn and Company, Inc., of Hartford, Conn., use a total of 10 Waldes Truarc Retaining Rings in this new mechanical-electric translator for automatic control of rotary speed. Truarc rings act as positioners and retainers to eliminate parts, simplify operations, save labor, and speed assembly.



**Rotor Installation.** In the old way, ball bearing was retained by a threaded shoulder and threaded bearing cup retainer.

**New way,** using two Truarc Rings (Series 5100 and 5000) eliminates 4 threading operations, bearing shoulder and threaded bearing cup. Assembly is quicker and easier, two ounces lighter.



**Flyweight Assembly.** Formerly, 2 holes had to be drilled in each of the 4 pivots, and 8 cotter pins were required.

**The new way,** using 8 Truarc E-Rings (Series 5133), replaces holes with grooves, reduces pivot size, leaves no projecting parts. Rings snap into place, speed assembly time by three minutes per unit.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring. 36 functionally different types...as many as 97 different

sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U. S. A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!



Send for new catalog supplement

# WALDES TRUARC<sup>®</sup> RETAINING RINGS

Waldes Robinson, Inc., 47-14 Austel Place, L. I. C. I., N. Y.  
Please send the new supplement No. 1 which  
brings Truarc Catalog RR 9-52 up to date.  
(Please print)

Name.....  
Title.....  
Company.....  
Business Address.....  
City..... Zone..... State.....

AY-687

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.



Hardened areas show darker  
at ends of rocker arm.

**JUST  
2  $\frac{3}{10}$   
SECONDS**

**for accurate  
selective  
hardening  
of this  
rocker arm**

*...using a Lindberg 50 KW High Frequency Unit*



In Detroit, a leading manufacturer of prestige autos increased production of rocker arms 300% by switching to a Lindberg 50 kw high frequency unit with a new work fixture. Production is now 1550 per hour . . . with no rejects due to unit failure.

Selective hardening of these pearlitic malleable iron rocker arms provides wear resistance from valves

and push rods. A sharp cutoff of the hardness is necessary because the center hole must be kept soft for further machining.

Lindberg high frequency units give continuous 24 hour a day operation with a maximum of dependability. If you have an induction heating application, you'd do well to talk things over with a Lindberg engineer.

**LINDBERG**  **HIGH FREQUENCY DIVISION**

Lindberg Engineering Company • 2491 West Hubbard Street • Chicago 12, Illinois



## NO! Who wants a DAVENPORT ON WHEELS?

Today's smart, low lines start many a sale that cramped interiors can kill! And you can't UNcramp interiors when they're overstuffed with seating reminiscent of Grandma's parlor.

That's why AIRFOAM Development Engineers have moved mountains of bulky upholstery — and replaced it with sleek new seating that improves appearance, improves the ride — and makes more room for PEOPLE!

The newest AIRFOAM seat-units, developed in collaboration with foremost automobile manufacturers, include cushions cast complete — all one piece. They eliminate bulky assemblies and much costly upholstery work — and how they delight modern motorists!

In your designing room, on your assembly line and on every sales floor, you'll find these AIRFOAM seat-units tremendous aids. Let us tell you more about them — and about other new AIRFOAM advancements.

Goodyear, Automotive Products Dept., Akron 16, Ohio



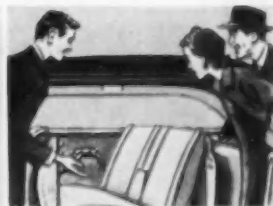
AIRFOAM makes interiors roomier, more luxurious



Premolded AIRFOAM replaces expensive handwork — looks even richer



Exciting new seating ideas become practical with AIRFOAM



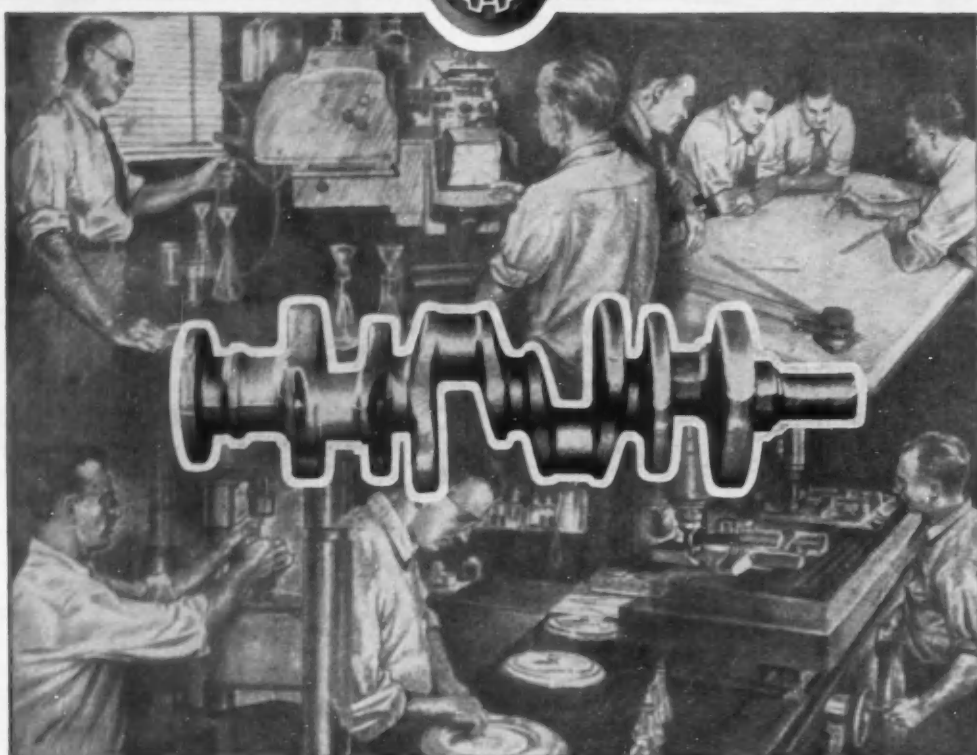
AIRFOAM can be your greatest sales-aid in years



**Airfoam** MADE ONLY BY **GOOD YEAR**  
THE WORLD'S FINEST, MOST MODERN CUSHIONING

Airfoam—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

AUTOMOTIVE INDUSTRIES, August 1, 1955



The crankshaft in the modern V-8 engine requires the ultimate in forging technique. Today's high compression engines, with continually increasing horsepower, further emphasize the importance of forging quality.

Wyman-Gordon technical know-how assures quality essential for maximum physical properties, uniform machinability and balance control . . . crankshaft forging specialists since the introduction of the internal combustion engine.

# WYMAN-GORDON

Established 1883

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

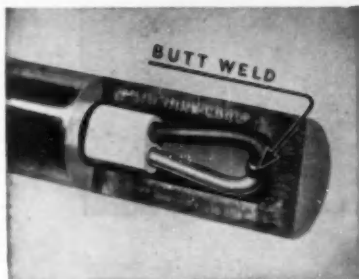
WORCESTER, MASSACHUSETTS

HARVEY, ILLINOIS

DETROIT, MICHIGAN

## Brown Butt-Welded Thermocouples have faster response ...better accuracy

TAKE a close look at the way the two wires are joined in a Brown thermocouple. This unique construction makes a big difference in the performance you get in temperature measurement. Instead of the usual twisted and welded joint, these couples are made by butt-welding the wires in a small but rugged junction . . . which gives these unusual characteristics:



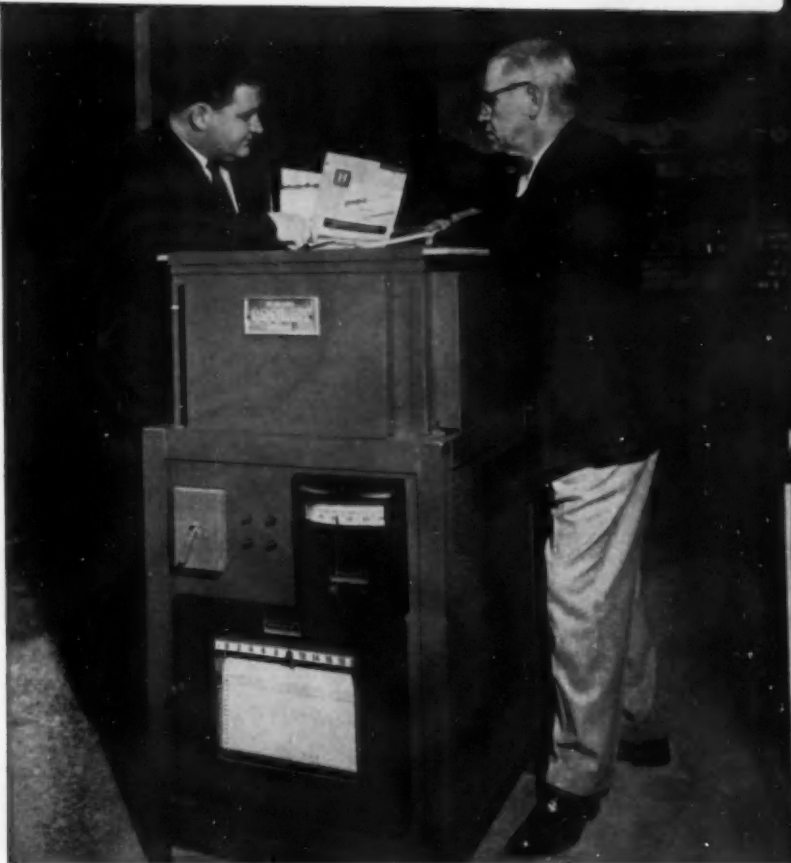
**Smaller mass for faster response.** Only slightly larger than the diameter of the wire, the butt-welded junction heats and cools far faster than conventional twisted joints.

**Improved accuracy** is obtained by the curved design of the wires, which minimize heat conduction away from the junction to the insulators.

**"Dead air space" eliminated.** The junction makes metal-to-metal contact with the bottom of the tube or well. Heat thus is conducted directly to the measuring junction, without the lags and errors of air conduction.

The overall result is that the Brown Butt-welded thermocouple is from  $1\frac{1}{2}$  to 9 times as fast as conventional couples!

Your HSM will be glad to give you complete data on the many sizes and styles in which these thermocouples are supplied, and to help you choose the most effective model for your specific application.



*Here's why it pays  
to know your*

**HSM**  
HONEYWELL SUPPLIES MAN

W. A. (BILL) GILL (*left*), Honeywell Supplies Man in the Indianapolis area, discusses features of Brown butt-welded thermocouples with W. B. Cooley, president of Cooley Electric Manufacturing Corporation . . . explains how the extra speed and accuracy of this couple design can be utilized in special Cooley calibrating furnaces.

Personalized help in selecting pyrometer supplies from the comprehensive Brown line is only one of the benefits to be gained from the HSM Plan. Equally important are its contributions to economy and convenience, through planned purchasing of all pyrometer supplies your plant needs.

Ask your local HSM to show you how this plan can work for you . . . as it has for hundreds of other plants. Call him at your local Honeywell office . . . as near to you as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR Co., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

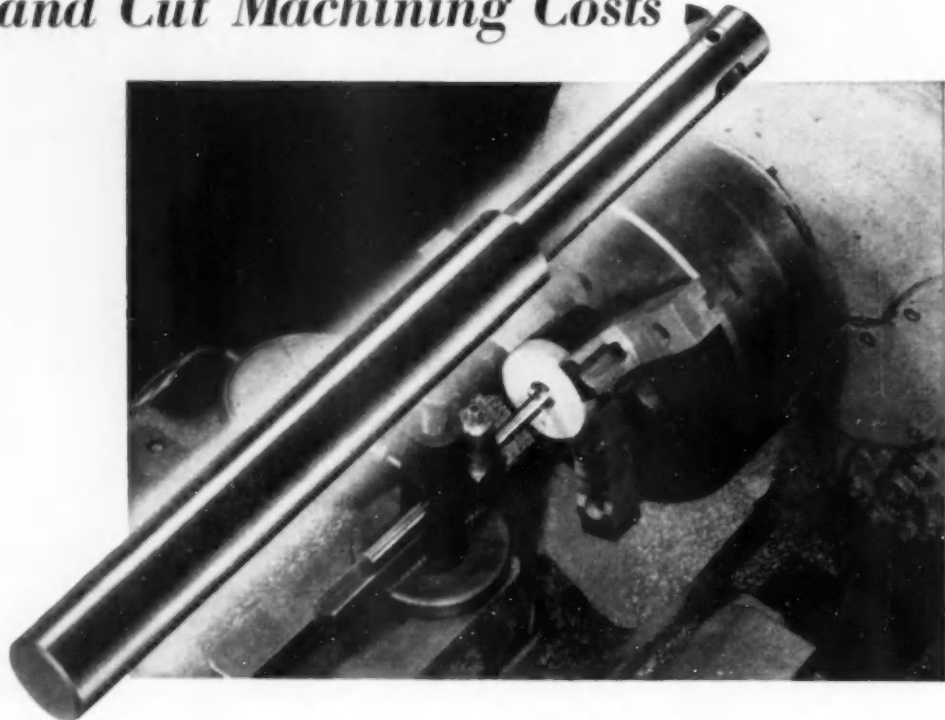
● REFERENCE DATA: Write for Pyrometer Supplies Buyers' Guide No. 100-G . . . and for the booklet, "The HSM Plan."



MINNEAPOLIS  
**Honeywell**  
BROWN INSTRUMENTS

*First in Controls*

# The New Way to Reduce Chatter and Cut Machining Costs



## ...MALLORY No-Chat\* Boring Bars

VIBRATION of cutting tools can be nearly eliminated and overall machining costs substantially reduced when you use Mallory No-Chat boring bars. Made from a unique alloy developed by Mallory metallurgical research, they are more than twice as dense as steel, and have far greater rigidity, tensile strength and thermal conductivity.

No-Chat bars permit you to make deep inside cuts with long tool overhang. You can often turn small diameters that used to require finish grinding.

Longer production runs. Tips last far longer

between grinds, because they run cooler and hold their edge longer.

Heavy cuts per pass are possible because vibration is damped out at the source... another saving in production time.

No-Chat bars are re-usable. Just replace the tip. Non-annealing No-Chat metal eliminates grain growth troubles.

A wide selection of square and round stock is available, in sizes useful for boring bars, tool shanks and for planer or shaper tools. Write to Mallory today for our bulletin that gives complete technical data on this unique way to do better machining at lower cost.

\*Trade Mark  
Patent Applied For

### Expect more... Get more from **MALLORY**

In Canada made and sold by Johnson Mather & Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario



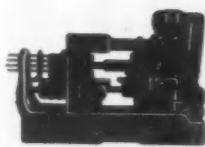
Serving Industry with These Products:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators  
Electrochemical—Capacitors • Rectifiers • Mercury Batteries  
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

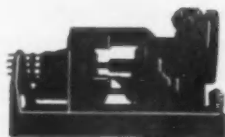
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

with the addition of

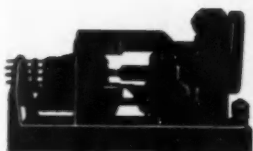
# 4 New Models



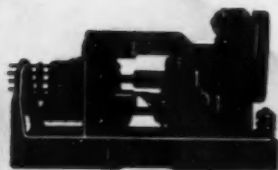
NEW 5/8" RA-8



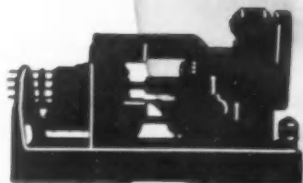
NEW 1 1/4" RB-8



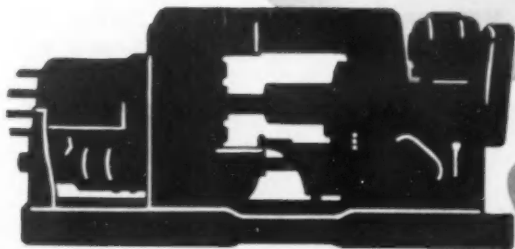
1 3/8" RB-8



2 5/8" RB-8



NEW 3 1/2" RB-8



NEW 4" RB-8

## Acme-Gridley 8-spindle advantages now extend to ALL ranges of bar work up to 4" diameters

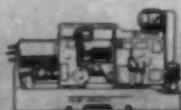
The principal performance advantages of Acme-Gridley 8-spindle bar automatics now can profitably be applied to bar work as small as the capacity range of a 5/8" machine and as large as 4" diameter. These advantages include:

- faster machining cycle time because of additional end working positions;
- "new machine" reliability longer—with carbide or high speed tooling;
- greater accuracy and uniformity of parts with fewer rejects;
- completion of a greater number of secondary operations in the primary machine setup (spindle stopping mechanism optional), with consequent savings in man hours, floor space and machine investment.

And for help-when-you-need-it, these new models (and all Acme-Gridleys) are backed up by a wealth of "complete line" tooling experience (literally thousands of tooling setups) plus a policy for service which has always played a mighty prominent part in maintaining National Acme's position of leadership.

It will pay you to plan your production the modern Acme-Gridley 8-spindle way. Why not ask us to tell you more about it?

SEE US AT THE MACHINE TOOL SHOW • SEPTEMBER 6 TO 17 • BOOTH NUMBERS 824 AND 708



OUR JOB: to provide the *Right Machine* for YOUR JOB

### THE NATIONAL ACME COMPANY



Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

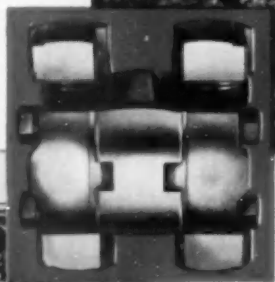
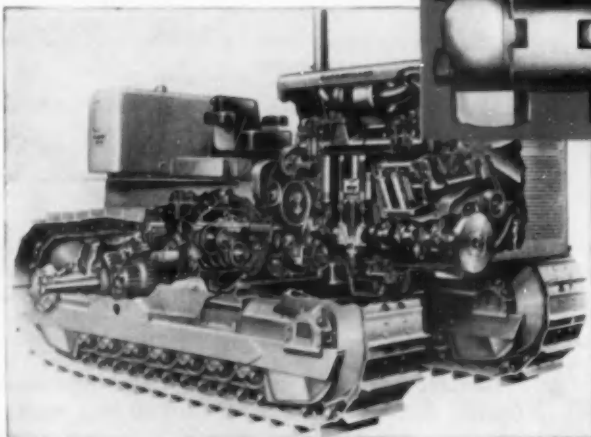
173 EAST 131st STREET • CLEVELAND 8, OHIO

# BEHEMOTH

All of the world's "biggest" tractors depend on MECHANICS Roller Bearing UNIVERSAL JOINTS to compensate for heavy-duty shocks and strains — severe enough to twist tractor frames. MECHANICS key-drive strength, flexibility and balance are unanimously specified by the largest tractor manufacturers to keep huge capacity machines operating long hours, day-after-day. They



The Cat D9 Tractor, shown below, sixth machine in Caterpillar's crawler line, is a 230-horsepower turbocharged tractor resulting from 10 years of big tractor research and development.



Thoroughly field tested during 1954, when Caterpillar put ten D9s on various jobs from coast to coast. This 56,000-pound machine has many earthmoving, construction, logging and pipe laying applications.

can't afford to permit large tractors and equipment to be kept idle by needless down-time. Let MECHANICS engineers help build reliability into your (200 to 50,000 foot pounds torque capacity) machines.

**MECHANICS UNIVERSAL JOINT DIVISION**  
Borg-Warner • 2024 Harrison Ave., Rockford, Ill.

## MECHANICS *Roller Bearing* UNIVERSAL JOINTS

For Cars • Trucks • Tractors • Farm Implements • Road Machinery •  
Aircraft • Tanks • Busses and Industrial Equipment

Another new development using

# B. F. Goodrich Chemical raw materials



Left: Jacobs Model 96-05 Rubber-Flex Collet Chuck  
Right: Jacobs Rubber Flex Collet

Rubber-Flex Collet Chuck and Collet made by The Jacobs Manufacturing Co., Hartford, Conn. B. F. Goodrich Chemical Company supplies only the Hycar rubber.

## Rubber-Flex Collet grips steel or glass

11 COLLETS GIVE 88 DIFFERENT SIZE GRIPS

WHEN the Jacobs people, who know their chucks, got together with the Hycar people, who know their rubber, they came up with the new Rubber-Flex collet chuck and the tightest, most accurate grip ever devised.

The chuck's Rubber-Flex collets, made with Hycar American rubber, have a capacity range eight times that of ordinary split steel collets. They come to grips equally well with either tools or work, solid stock or thin-wall tubing, compressible or brittle materials... even glass and ceramics.

Hycar rubber is a basic factor in the success of the collet chuck on a

whole new range of applications... on grinders, jig borers, reamers, and other high precision machines. The Hycar locks the collet's steel jaws mechanically together, insuring an absolutely parallel grip over the entire bearing surface, and actually *tightening* the grip when torque is applied. And vitally important, Hycar effectively resists the deteriorating action of lubes and coolants, withstands shocks and flexing.

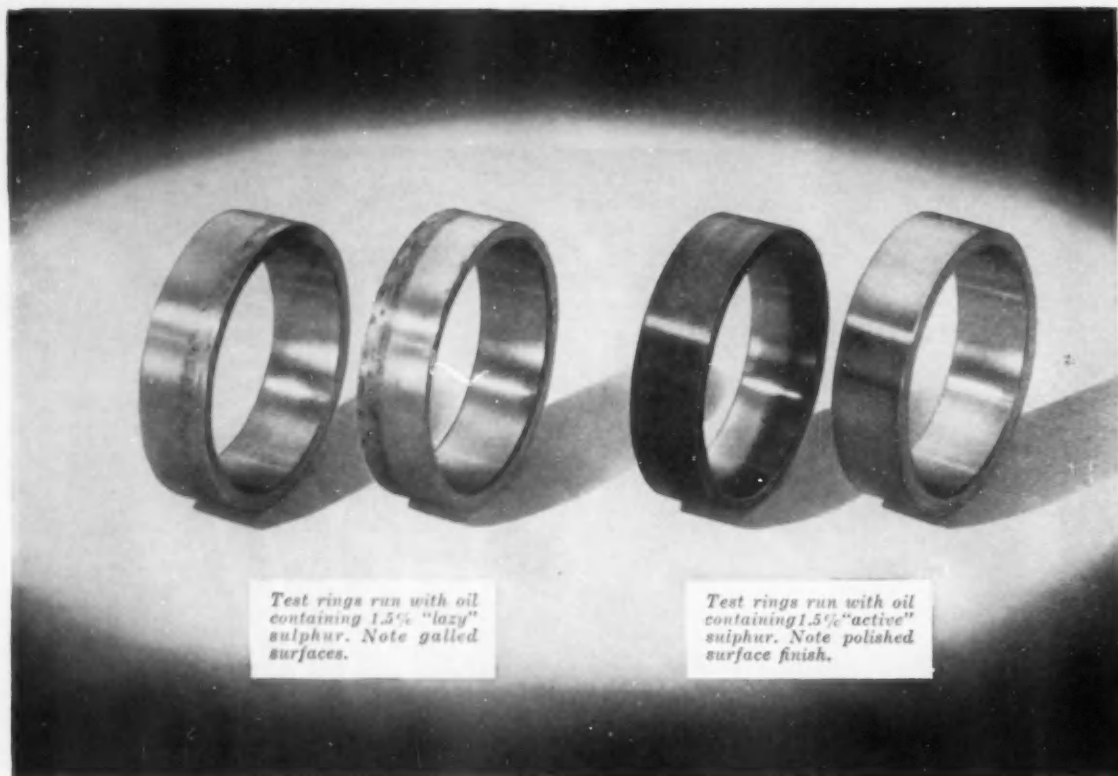
Versatile Hycar is used in many industries. It has exceptional resistance to abrasion, oil, gas, heat, cold and many chemicals. Any one or combination of Hycar's qualities may be just what you need to improve a

product part or solve a tough product problem. For complete technical service and information on uses for Hycar, please write Dept. CA-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company  
A Division of The B. F. Goodrich Company

**Hycar**  
Reg. U.S. Pat. Off.  
*American Rubber*

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors



*Test rings run with oil containing 1.5% "lazy" sulphur. Note galled surfaces.*

*Test rings run with oil containing 1.5% "active" sulphur. Note polished surface finish.*

## Only **ACTIVE** Sulphur Provides Fluid Lubrication Under Extreme Pressures

This comparative test proves it! Both tests were run on an SAE Lubricant Tester using two oils with the same percentage of sulphur. The specifications were similar—but look at the results!

The set of rings on the left were run with an oil containing "lazy" sulphur that did not provide the necessary anti-weld qualities. Under the heavy loads present in the test, the rings quickly galled and seized. The pair on the right were run

with an oil containing "active" sulphur, the *only* type of sulphur that will prevent galling or seizure. It is performance that counts, not specifications.

"Active" sulphur in a cutting oil, readily reacts with the metal surfaces of the tool, chip and workpiece to produce metallic sulphide films that become fluid lubricants when sufficient heat is generated, and provide lubrication under the high temperatures that exist in the cutting orbit.

Stuart Oil Company's Shop Note Book, Bulletin S-2, contains further information on how to select a sulphurized cutting oil. Write for your copy today, and ask to have "the Man in the Barrel", your Stuart Representative, call too. He will help you select the cutting fluid that will provide the very best results under the conditions you will subject it to.

**D. A. STUART OIL COMPANY, LTD.**  
2733 S. Troy St., Chicago 23, Ill.

**More than a "Coolant" is Needed**

Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.

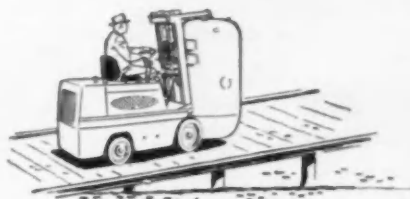


# Stuart Oils

Time Tested Cutting Fluids and Lubricants

**IF IT MOVES**

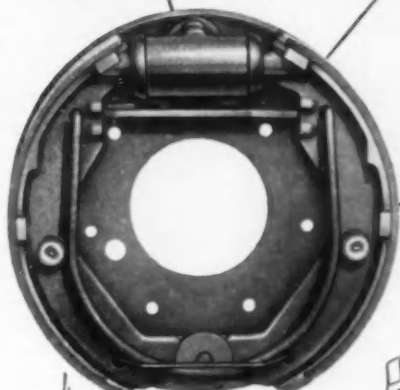
**WE CAN STOP IT!**



# TDA BRAKES

...for every industrial  
or automotive application where  
braking is required!

**FSH...Floating Shoe Hydraulic Brake**  
**Designed for close control with heavy loads**



#### Mechanical Parking Brake Hook-up

A separate parking brake is no longer necessary with FSH. If specified, the FSH Brake can be furnished with a mechanical parking brake linkage that functions independently of the hydraulic system.



#### Long Life Lining

Brake lining is bonded to the shoe to give maximum lining area with no lining waste.



#### Positive Automatic Adjustment

One application of the foot pedal sets the automatic adjustment. No further adjustment of the brake is required during the full life of the brake lining.



#### Positive Contact Drum Seal

For applications where a sealed brake is required, the FSH is designed to incorporate a seal between the brake backing plate and brake drum.



The FSH Brake presents some remarkable new advantages to manufacturers who need a better, longer lasting Hydraulic Brake. The features of the FSH were developed after years of field work and laboratory study. These advantages can be a road to new economy and better control for *your* equipment.

FSH Brake shoes operate with a floating action. This eliminates the danger of liner loads concentrating at one point . . . permits the shoe to follow the drum. The result of this even load distribution is a highly dependable, controllable brake—in *either direction* of travel. This is especially important when stacking heavy loads at high levels and maneuvering at close quarters.

**For Additional Information . . .** contact the Timken Brake Division. Complete details on the FSH Brake are available. And, a staff of experienced engineers can assist you with any brake problem you encounter.



## Chromium and Its Effects in Alloy Steels

As previously pointed out in this series, the elements that together make up an alloy steel work both singly and collectively. In a sense they are like the components of a machine, each having its job to do, yet each working with other components to achieve an overall result.

An earlier discussion was devoted to the functions of nickel. In this one we shall outline briefly some of the purposes of chromium, another of the fundamental alloying elements.

Chromium is a versatile agent. Among other things, it fosters depth-hardenability, improves surface resistance to abrasion and wear, and promotes carburization. Of the common alloying elements, chromium ranks near the top in hardenability. This property tends to make high-chromium steels relatively air-hardening; hence it is valuable in applications where, for one reason or another, liquid quenches are undesirable.

Chromium steels are relatively stable at high temperatures and are often used where resistance to heat is important. Moreover, the presence of chromium is a vital factor in helping to retard or prevent corrosion.

The uses of chromium steels are many and varied. Among the more

familiar items that often contain chromium are hand tools, gears, springs, turbine wheels, ball and roller bearings, forged shafts and rotors, etc. There are of course numerous others; virtually no list would be all-inclusive.

One of the most useful of the alloys, chromium has been the subject of long study by Bethlehem metallurgists. These technicians have a thorough working knowledge of its effects in various types of analyses. Whenever you have a problem involving chromium steels, or would like to know more about the subject in general, by all means communicate with the Bethlehem staff. Our men will come to your office or plant at any time. You will find them co-operative and helpful.

And please remember, too, that Bethlehem makes the full line of AISI standard steels, as well as special-analysis steels and all carbon grades. Your inquiries will receive our most careful attention.

BETHLEHEM STEEL COMPANY  
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

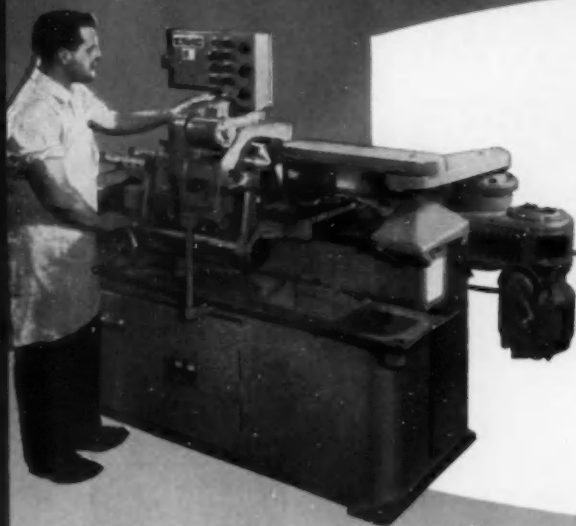


**BETHLEHEM STEEL**

# NOW

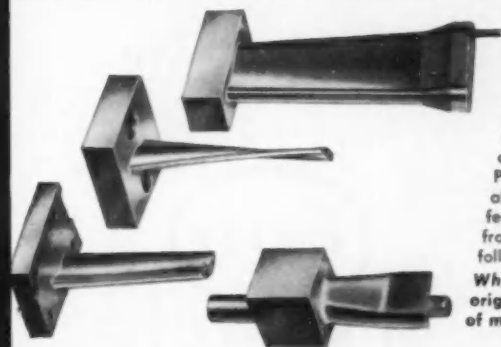
# FIRST TO PRODUCE ORIGINAL

## 3-DIMENSIONAL AIRFOIL SHAPES



- WORKING DIRECTLY FROM SIMPLE CROSS-SECTIONAL TEMPLATES AND DATA ON AIRFOIL DRAWING
- WITH AUTOMATIC INTERPOLATION—TRUE FAIRING BETWEEN AND BEYOND THE CROSS-SECTIONAL STATIONS
- WITH NON-CONTACTING TRACER CONTROL
- PRECISION MACHINED
- IN HOURS INSTEAD OF WEEKS

## NEW MODEL 102 electronic AIRFOIL MILLING MACHINE



Heretofore original masters were made by hand — no generating method being available. Now, in a matter of hours rather than weeks, the first master can be produced — hours in a single machine rather than weeks of skilled bench work. Simple templates, made to represent designer's airfoil cross-sections, together with data on drawing, are the only "special tools" needed by the machine. True fairing between and beyond the designated cross-sections is automatically produced by the machine interpolation systems. True fairing of shape and of twist-of-shape is accomplished automatically.

Principal motions of workpiece during generation of master airfoil are: (1) rotation about axis, (2) high-speed motion of milling head to and from axis, and (3) slow feed of milling head parallel to axis. Signals to produce motion (2) are obtained from the completely new NON-CONTACTING tracer control, which always exactly follows, but never contacts the constantly changing interpolation "flexure".

Why not use this method to generate the whole airfoil surface on your original airfoil masters — and, in addition, to provide a convenient means of machining pilot production runs?

USE THIS COUPON TO SEND FOR COMPLETE INFORMATION

MANUFACTURED BY THE NEW ENGLAND MACHINE & TOOL COMPANY  
Sales . . . and Complete Sales Engineering and Maintenance Service . . . Through

### PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY  
WEST HARTFORD 1, CONNECTICUT, U.S.A.  
SINCE 1869

*First Choice*  *for Accuracy*

BRANCH OFFICES IN PRINCIPAL CITIES

MACHINE TOOLS • CUTTING TOOLS • GAGES

PRATT & WHITNEY — DIV. NILES-BEMENT-POND CO.  
18 Charter Oak Blvd., West Hartford 1, Conn.

Please send my free copy of Circular No. 575 fully describing the new Model 102 Airfoil Milling Machine.

NAME

POSITION

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ZONE

STATE

## In over 100 places... (here are just a few examples)

Rear Window Weatherstrips  
Tail Pipe Insulator Support  
Wiper Hose  
Antenna Gaskets  
Division Channel Weatherstrip

Battery Drain Tubes  
Gearshift Lever Arm Bushing  
Frame and Axle Bumpers  
Spring Shackle Bushings  
Radiator Drain Tube

Dash Liner & Cowl Trim Pads  
Door Check Arm Bumpers  
Headlight Lens Gasket  
Gas Tank Filler Neck Grommet

Radiator Hose  
Heater Hose  
Body Insulators  
Steering Post Bracket Insulator  
Spark Plug Covers  
Parking Light Lens Gasket



## Enjoy Butyl parts help new cars perform better

Many of today's cars run like new, drive like new, perform like new for extra thousands of miles with over 100 parts made from Enjoy Butyl—the super-durable rubber that has a low cost, yet outperforms and outlasts, by great margins, rubbers formerly used. Under the toughest conditions of weather and use, Enjoy Butyl parts stay like new.

This amazing rubber—finding wider and wider use in the automotive industry—is now readily available in new non-staining grades for white and light-colored parts. For further information, and for technical assistance in the uses of Enjoy Butyl, contact the Enjoy Company.



**ENJOY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.**  
District Office: 11 South Portage Path, Akron 3, Ohio.



Enjoy Butyl is the super-durable rubber with outstanding resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

35 SUCCESSFUL YEARS OF LEADERSHIP IN SERVING INDUSTRY

# Complete BROACH TOOLING for Customer's Machines

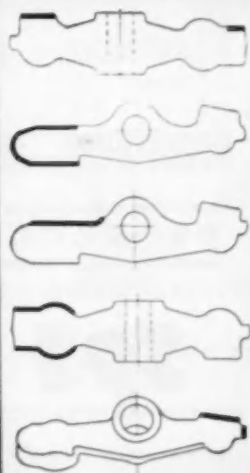
## CONTINENTAL CAN RETOOL YOUR PRESENT BROACHING EQUIPMENT FOR HIGH PRODUCTION AND INTERCHANGEABILITY, AT MINIMUM COST

These forged steel rocker arms are economically processed with Continental designed and built broaches, holders and fixtures. The work is done in five operations on two vertical surface broaching machines, one having a single ram and the other a dual ram.

More and more manufacturers are turning to broaching for machining production parts. It's the fastest method of removing stock to precision limits. For a quotation on tooling for your broaching machines call in your local Ex-Cell-O Representative or contact the Continental Division of Ex-Cell-O in Detroit.

Here is the fixture and broach tooling for the first operation.

THE HEAVY LINES INDICATE  
THE METAL REMOVED IN  
EACH OF THE 5 OPERATIONS



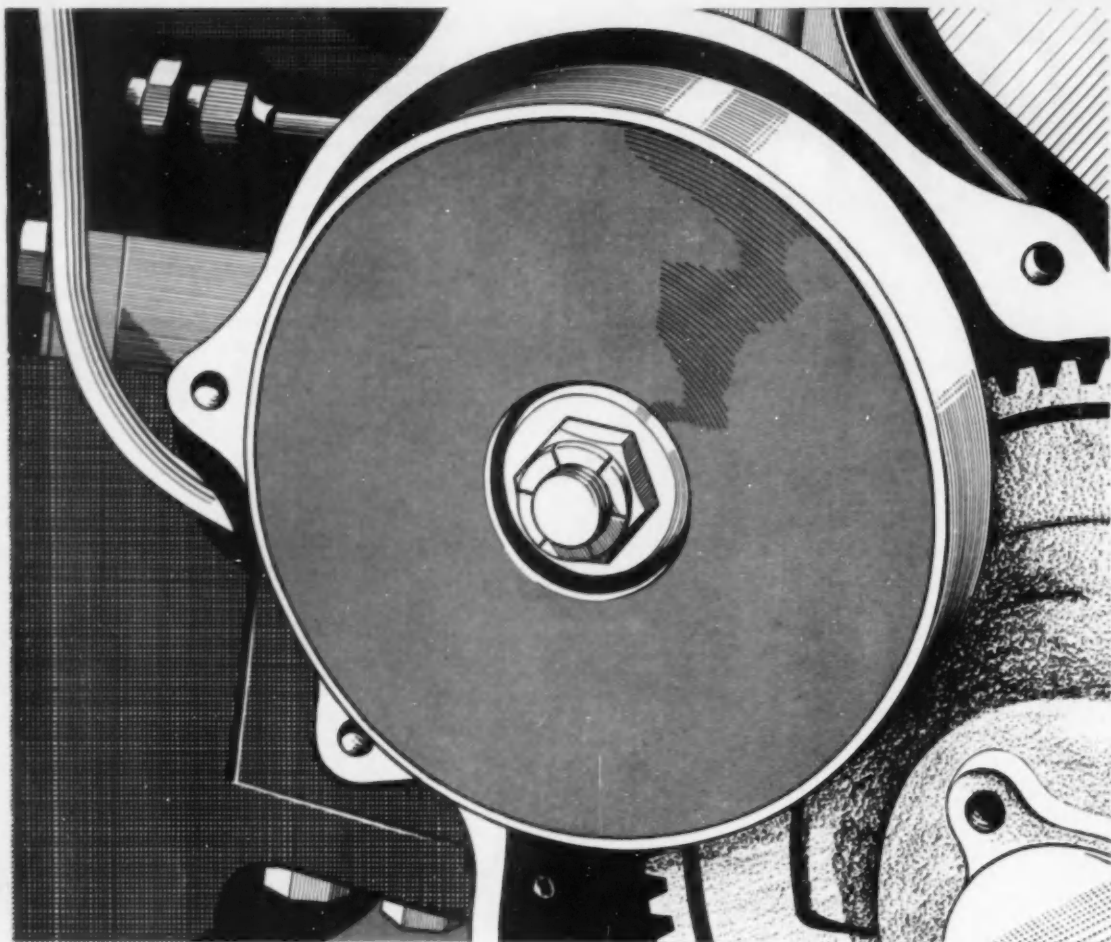
**OPERATION 1:** Finish broach thrust face and broach locating surface at opposite end. Operation is done on single-ram vertical surface broach machine. Work is located in fixture on floating pin, which allows part to rest firmly on lower anvils when clamped. Spring loaded jacks are wedge locked automatically. Broaches for both cuts are carried in one holder. The only change necessary to accommodate opposite hand parts is to exchange adapters on the fixture.

**Continental** **TOOL WORKS**

Division of EX-CELL-O Corporation, Detroit 32, Mich.



## FLEXLOC AT WORK



**MORE AND MORE FLEXLOC LOCKNUTS** are being used where assemblies must be held together. This electric chain saw is a good example of an application for which FLEXLOCS are well suited.

A FLEXLOC Self-Locking Nut is used here to hold the driver gear in place. Even high-speed cutting, extreme vibration, and rough handling do not loosen the FLEXLOC locknut. These one-piece, all-metal locknuts are available in a full range of sizes. Standard FLEXLOCS are stocked by authorized industrial distributors in sizes from #4 to 2". Write for Bulletin 866 and samples. STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.

**DO YOU KNOW?** Standard FLEXLOCS smooth off rough bolt threads. The locking threads on all-metal FLEXLOCS are not chewed up when used on rough bolts. Standard FLEXLOCS lock securely on bolts varying in diameter tolerances. The all-metal, resilient locking sections of the nut accommodate themselves to the diameter tolerances. Standard FLEXLOCS are one piece, all metal. They are not affected by temperatures to 550°F. Nuts lacking these features have a more restricted temperature range.

Standard FLEXLOCS lock securely—stopped or seated—when  $1\frac{1}{2}$  threads of a standard bolt are past the top of the nut.

Standard FLEXLOCS are not affected by moisture, oil, dirt or grit. They lock efficiently under all conditions, regardless of the vibration encountered.



**FLEXLOC**  
LOCKNUT DIVISION

**SPS**  
JENKINTOWN PENNSYLVANIA

# **GUNITE** STEEL WHEELS FOR TRUCKS AND TRAILERS

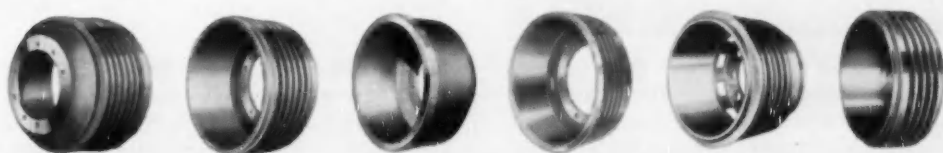


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Economy . . . Strength . . . Gunite Wheels and tubeless tires form the lightest combination at the lowest price. Specify Gunite Wheels on your new equipment.

## **Gunite Brake Drums for Trucks, Trailers and Busses**



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*Established in 1854*

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TYPICAL EXAMPLES



**BENDIX LINKAGE TYPE POWER STEERING**—Because Bendix\* Power Steering is of the linkage type, manufacturers find it especially adaptable for production line installation without extensive engineering charges. Manufacturers can now meet the ever-increasing demand for power steering more efficiently and more economically with Bendix Linkage Type Power Steering.

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## High Spots of This Issue

### ★ International Aeronautical Conference

Well attended by experts from all over the world, the recent joint meeting of IAS and RAS (England) was a huge success from every viewpoint. The 18 technical papers presented stressed the research advances made in many aeronautical fields. Page 48.

### ★ Buick's Fully Automatic Gear Process Lines

Particular feature of interest at the Buick plant in Flint, Mich., is a rather unique gear process line. Set up to produce small planet pinions for Dynaflo drives, it has 40 special machines of various types, many of them described. Page 52.

### ★ Important Steps in Making Hollow Crankshafts

Numerous advantages are claimed for the hollow cast crankshaft used in the German Ford Taunus 15M, such as savings in weight and easier machining. The author tells the story of how the unit was developed and the various operations involved. Page 62.

### ★ Single-Purpose Plant for Front Suspension Ball Joints

Located in Fruitport, Mich., is an interesting plant where Thompson Products turns out ball joint assemblies for passenger car front suspension systems. A look inside the facility shows the amount of mechanization employed. See Page 64.

### ★ Special Set-up for Heat Treating Cuts Fire Hazard

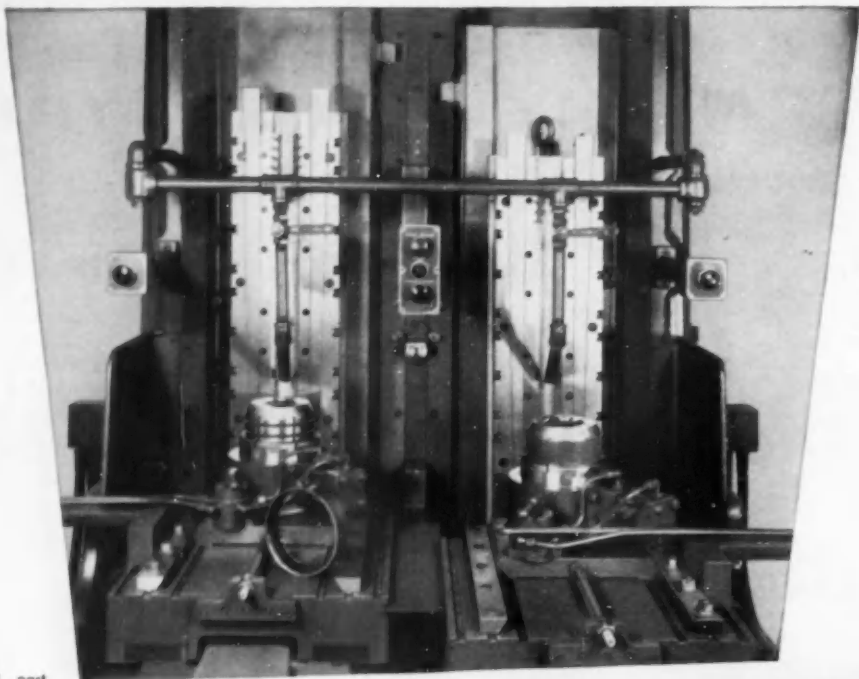
Safety from the viewpoint of protection against fire is a fundamental feature of the heat treating facilities at the Ford Livonia, Mich., automatic transmission plant. Equipment used is studied and illustrated in this report. See Page 70.

### ★ 46 New Product Items And Other High Spots, Such As:

Machine Tool Show preparations; death of a car; ramjet testing laboratory; emergency power station on wheels; arc welding tractor components; free-piston Diesel compressor; automated heat treating equipment.

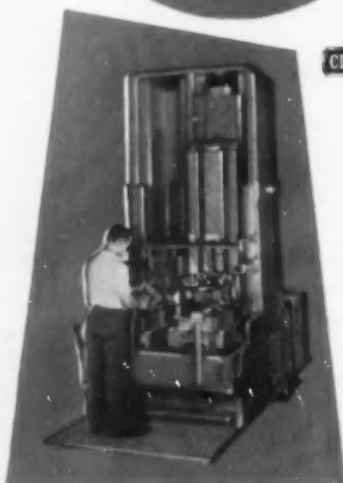
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**AUTOMOTIVE INDUSTRIES COVERS—**  
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES  
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •  
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT  
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT  
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Drawing of part.  
Solid area indicates  
material removed.

## BROACHING THE EARS On Transmission Bands WITHOUT DISTORTION



CINCINNATI No. 10-66  
Duplex Vertical Hy-  
dra-Broach, Catalog  
No. M-1709-1 con-  
tains complete speci-  
fications. Write for  
a copy.

### CINCINNATI Duplex Hydro-Broach tooled up to broach transmission band assembly

Material	Steel
Operation	Broach 41° angular grooves
Stock removal	From solid
Production	283 per hour
Equipment	CINCINNATI Duplex Vertical Hydro-Broach Machine

You probably have been stymied more than once by machining operations on thin fragile parts. How one part of this type was taken out of the headache class and set up in a smooth, low-cost production schedule is illustrated here. It shows a CINCINNATI Duplex Vertical Hydro-Broach Machine, tooled up to broach the ears on transmission band assemblies. There are two hydraulically operated, manually controlled fixtures, one for each ram. While the part in one station is being broached, the operator reloads the other fixture. He can take as much time as necessary because the rams do not go through their cycle until the pre-set cycle buttons are pressed (a CINCINNATI safety feature). Other CINCINNATI advantages for low-cost broaching operations include hardened and ground ways... automatic way lubrication, with manual flushing lever... dove-tail clamp arrangement for interchangeability of broach holders and cutting tools as a unit. Principal features and specifications are outlined in Sweet's Machine Tool Catalog. If you would like to have complete data, write for publication No. M-1709-1.

THE CINCINNATI MILLING MACHINE CO.  
CINCINNATI 9, OHIO

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MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING  
MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES  
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

# News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 113, No. 3

August 1, 1955

## Combined Heating-Cooling Unit Offered on Packard Luxury Cars

Packard has announced as a factory-installed accessory a combined heating and cooling system for its luxury cars. The unit, which will be offered later as a dealer-installed option, will sell for \$652.

All components of the Packard air conditioner-heater are located under the cowl or in the engine compartment. Air outlets are located on top of the instrument panel or at floor level, and louvers allow driver or passenger to adjust direction of cool air flow. All temperature control is accomplished by a single lever on the instrument panel.

## Car Sales Decline Slightly For Second Month in July

Latest figures indicate a small drop in new car sales in July for the second successive month. It is expected that, due to a normal summer let-down in sales and new model changeovers, production may drop 25 per cent below that of the second quarter during the current three-month period.

Some companies, which have been pouring forth reports of record sales during the past few weeks, have eased off slightly on publishing figures for June and July. For example, although General Motors reported that its sales of new cars during the first 10 days of July reached "an all-time high" of 80,012 units for that period, the figure was a substantial drop from the 117,558 retail sales during the first 10 days of June this year.

Although Mercury sales dropped to 35,784 in June from 38,877 in May, the division had a record-breaking six-month period as retail deliveries totaled 200,526 units. Buick set a record for June with sales of 66,411 units, but the month's total was down



## BIRDS-EYE VIEW OF SPRAWLING FORD MAHWAH PLANT

Shown above is an aerial view of the new Mahwah, N. J., automobile assembly plant (see *AI*, July 15, p. 40) of the Ford Div. of Ford Motor Co. A one-story building, 2115 ft long and 790 ft wide, provides 1,714,050 sq ft of manufacturing space. It includes approximately 222,700 sq ft for railroad and truck unloading and loading docks and a 10,800 sq ft quality control laboratory. Fronting the plant structure is a two-story administration building. Paved parking lot will accommodate about 3000 cars.

nearly 6000 units under May's total of 72,320.

The drop in Buick's sales during June was to the advantage of Plymouth. The latter, fighting to regain third place, reported that its sales in June climbed to 65,120 units, compared with 62,588 in the preceding month.

Chevrolet turned in several impressive records for June, among them an all-time high number of vehicle sales. For June, the division's car sales totaled 170,341, against about 149,000 units in May.

So far in 1955, automobile factories have built more than 4.5 million cars, compared with approximately 3.2 million in the same period last year. It is likely that the industry will build 1.5 million cars during the current quarter.

## White Motor Signs New Pact With UAW

White Motor Co. has followed the pattern set by Ford and GM in providing a supplementary layoff pay plan. The company estimates that the total package of benefits granted under its new three-year contract with the UAW-CIO amounts to about 20 cents an hour.

In addition to the layoff plan, to which the company contributes five cents an hour for each of its 4000 employees, the new pact includes a wage increase of six cents an hour, plus an additional six-cent-an-hour boost each year until the contract expires. Other provisions include triple time for holiday work, and an increase in pension, hospitalization, and insurance payments.

# News of the AUTOMOTIVE



## CLARK TRUCK AIDS MATERIALS HANDLING AT WAUKESHA

Palletization and use of a battery-powered, hydraulically-operated pallet truck aids the movement of heavy parts to and from machining stations at Waukesha Motor Co. Parts are stacked on wooden pallets in 5000-lb loads and moved from one operation to the next. After each operation, parts are replaced on pallets. Left photo shows Powerworker dropping load of motor cases for boring operation. Load is lowered while machine inches into position under hoist.

## Automatic Trunk Lock Offered By Cadillac

Cadillac now is offering a remote control trunk lid lock which permits a driver to unlock the trunk without getting out of the car. A control button inside the glove compartment actuates a small motor in the trunk and unlocks the lid.

The device does not, however, automatically fully raise or lower the deck lid, but merely opens the lock from inside of the trunk. Price of the unit, available only as a factory-installed option on 1955 models, is \$35.

## Packard Reports Higher Profits On Used Cars, Less Depreciation

Packard claims that the average profit on sales of its used cars has increased by 70 per cent over last year's levels. It also states that the monthly depreciation rate on one- and two-year-old Packards is at present the lowest for any car in the high-price class.

According to a study made recently by the company, the ratio of trade-ins on new Packards is averaging 81 per cent, considered high for the lux-

ury car field. Packard also claims that nearly 60 per cent of the trade-ins on new Packards involve competitive makes of cars.

## Nine Concerns Share Contracts From Ordnance of \$70 Million

New Ordnance contracts totaling about \$70 million have been awarded to nine Michigan companies. From present indications, more contracts are expected to be forthcoming. All material under the contracts is to be produced during 1955 and 1956.

Recipients of contracts include: Fisher Body Div., \$13.8 million for tank spare parts; \$4.8 million for "kits," and \$2.8 million for lay-away of equipment at the Grand Blanc, Mich., tank plant; AC Spark Plug, \$1.6 million for anti-aircraft guns; Pontiac Div., \$7.5 million for 20 mm automatic guns; Chevrolet Div., \$3.7 million for ½-ton trucks.

Other concerns and awards include: GMC Truck & Coach Div., \$10.5 million for 2½-ton trucks; Chrysler Corp., \$9.9 million for engineering services and \$1.3 million for spare tank parts; Ford Div., \$1.2 million for pick-up trucks and \$2.5 million

for commercial sedans and station wagons; Studebaker-Packard, \$8.5 million for 2½-ton trucks; and Checker Cab Manufacturing Co., \$2.9 million for trailers.

## First Quarterly Profit Figure Noted by American Motors

The first quarterly profit since Nash and Hudson joined forces in May, 1954, has been reported by American Motors Corp. For the three-month period ended June 30, the corporation's earnings totaled \$1.59 million, against a loss of \$3.84 million in the like 1954 period, when Hudson operations were included for only May and June.

AMC sales climbed substantially in the quarter to more than \$137 million from \$104 million in the same 1954 period. Sales for the nine-month period totaled \$348 million.

The corporation produced more than twice as many cars in the quarter ended in June as it did during the comparable 1954 period. Output was estimated at 56,036 Nash and Hudson cars for the period.

## ASTM Marks High Attendance At Week-Long Annual Meeting

Chalking up a near-record registered attendance of 2537 persons, the American Society for Testing Materials brought to a close its 58th Annual Meeting at Atlantic City, N. J., last month. At the week-long meeting the Society held 32 technical sessions and approximately 700 technical committee meetings.

Sixty-six of the ASTM technical committees presented reports. Sixty-seven new specifications and methods of test were approved as tentative, and revisions in 351 existing tentatives and standards were acted upon.

## De Soto Sales Soar To Six-Month Height

Chrysler Corp.'s successful comeback in 1955 is reflected in a report from De Soto Div. For the first half of this year, the division nearly doubled its sales over the same period in 1954, as high sales in June brought the six-month total to 72,692 cars, compared with 37,736 last year.

# AND AVIATION INDUSTRIES

## **S-P and American Motors Corp. Chalk Up Gains in Car Market**

Despite the strong competition in the automobile industry since the beginning of the year, two of the three independent car companies—Studebaker-Packard and American Motors—have made impressive sales gains. Kaiser-Willys so far is the only independent which has failed to wrest a bigger share of the market than it held last year.

Both Studebaker-Packard and American Motors, on the other hand, have increased their shares of automobile production. Studebaker-Packard's share of total industry output has climbed to 2.72 per cent from two per cent in 1954, while AMC has nearly doubled its share from 1.8 per cent last year to 2.47 per cent. Kaiser-Willys' market penetration has dropped to 0.16 per cent from 0.3 last year.

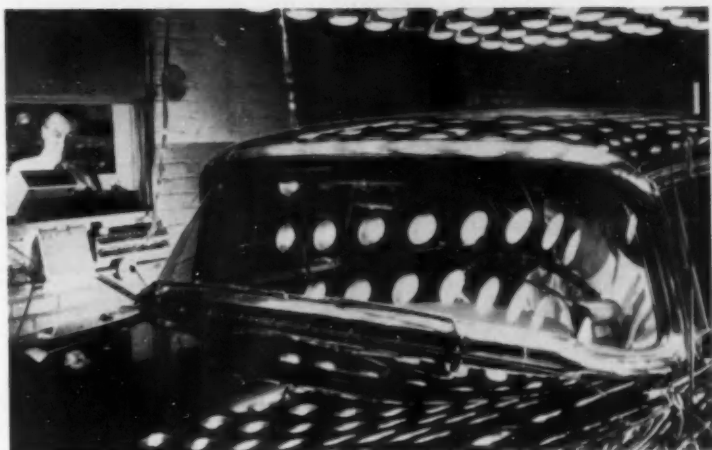
One of the most impressive comebacks has been recorded by Packard, particularly in the luxury car class which the company has been pushing extensively. In June, Packard already had surpassed production of 45,000 cars, and, if its present pace continues throughout the year, the company will certainly achieve, or come close, to its goal of 90,000 cars.

## **New Chrysler Div. Body Plant Incorporates Many Innovations**

Assembly of fenders, hoods, and deck lids to automobile bodies prior to metal finishing and painting is one of the distinctive features of Chrysler Division's new \$20 million body plant in Detroit. The new unit embodies many other novel manufacturing techniques which are expected to boost Chrysler Div. production capacity by 40 per cent to a maximum of 1200 cars a day.

Some final work is yet to be done on the plant to coordinate operations with the division's adjoining plants, which ended production runs on 1955 cars July 25. They will go into operation on the 1956 Chrysler cars about the middle of this month (August).

The new plant occupies 667,000 sq ft of space and boasts a 14-mile-long continuous conveyor system with 50



## **SUMMER WEATHER READILY SIMULATED**

*Engineers check interior temperatures of an air conditioned car in a wind tunnel test cell at Frigidaire Div. of General Motors Corp. Actual summer driving conditions are being simulated, with the car operating up to speeds of 60 mph on a dynamometer. Heat, wind, and humidity also surround the car to simulate every type of summer weather encountered.*

new automatic transfer devices located at various junction points. Overhead conveyors have been installed in the frame and chassis and body hardware assembly areas.

In addition to the network of conveyors, a specially designed hook has been installed to convey seat backs into car bodies with minimum effort on the part of workers. Body cleaning, bonderizing, and painting operations are confined to the second floor of the two-story plant, while the first floor is devoted to receiving, sheet metal operations, first-aid hospital, and smaller operations and storage.

A massive filtered air unit pumps 382,000 cfm into the plant and provides up to 20 air changes an hour. Used air is forced through a special exhaust filtering system which removes any remaining particles before the air is released outside.

To provide for simultaneous painting with the score of different colors, the Body-Finishing Dept. has 58 special tanks of 55-gal capacity, and the pressurized paint lines alone hold 5400 gal of paint. Paint spraying booths feature a system in which air is filtered through a water wash and

through two different throw-away-type filters. The booths have a combined total length of nearly 800 ft.

Paint-baking ovens total 4705 ft in length. Body finish is baked at 250 F for at least 37 minutes, then moved into cooling tunnels, where 211,200 cfm of air drop the temperature of painted surfaces to 125 F in two minutes.

Cushions and other car interior appointments now will be installed after the car leaves the final assembly line in the new plant. Previously, these were installed early in assembly.

## **Murray Seeking To Buy Easy Washing Machine**

Murray Corp. of America continues to look toward wider business horizons. In line with its diversification program, which it launched last year after going out of the car body-building business, Murray now is planning to buy the washing machine assets of Easy Washing Machine Co., Syracuse, N. Y.

The purchase is still subject to the approval of Easy stockholders. It also would include Easy's inventory, sales and marketing organization and trade name.

# News of the AUTOMOTIVE



## ITALIAN STYLING AND U. S. POWER IN NEW SPORTSTER

*Pictured above is the new Firebomb four-passenger sports car to be offered by Dual Motors Corp. of Detroit (see AI, April 1, p. 34). Powered by a modified Dodge Super Red Ram V-8 engine with a four-barrel carburetor and 225 hp., it will have a body built by Carrozzeria Ghia of Italy on a 115-in. wheelbase.*

## AMC Balks at GAW Pattern; Other Troubles Arise

The Ford and General Motors wage settlement formula continues to spread through the automotive industries as the UAW-CIO this week (Aug. 1) starts taking strike votes against American Motors Corp. The latter has upset what appeared to be a pattern in the automobile industry by flatly rejecting the union's demand for the modified guaranteed annual wage. American Motors' contract expires on Aug. 12, and, if an agreement is not reached between the company and union by then, a strike could be called.

AMC's basic objection to the supplemental unemployment principle granted by Ford and GM is that the company would be penalized by paying more for the whole package than Ford and GM. AMC claims that several items in its contract bring its costs to as much as eight to ten cents an hour above those of the Big Three. Whether it will succeed in removing those inequities is still an open question.

When American Motors started negotiations with the union on April 13, it made its contentions clearly known. The company said it was determined to have collective bargaining based upon the "economic facts of American Motors" and not on the

basis of pattern settlements as in the past. The company and union will meet again on Aug. 8, four days before AMC's contract expires.

### More Suppliers Accept Layoff Plan

Meanwhile, automobile suppliers and other automotive concerns continue to fall into line on the supplemental layoff benefits plan. Both Kelsey-Hayes Wheel Co. and Auto Specialties Manufacturing Co. reached an agreement on the same day with the union on a new three-year contract. The benefit packages are estimated at 22.5 and 25 cents an hour, respectively. Kelsey-Hayes' contract covers 3200 employees, while Auto Specialties' pact covers 1700 workers at three plants.

Earlier, Eaton Manufacturing Co. and Barcey-Nicholson Co. made settlements with the union on similar principles, and the Automotive Tool and Die Manufacturers Association also embodies the unemployment compensation factor in its agreement.

Talks are in progress at Allis-Chalmers Manufacturing Co. for the first new contract in five years and at Deere & Co. It is understood that the same kind of packages are being asked of those concerns as originally asked of Ford and GM.

### Other Storm Clouds on the Horizon

Displeased with the new contract granted by the car makers, workers in some skilled classifications are taking action toward seceding from the union. At Flint, Mich., 2000 skilled tradesmen are seeking to divorce themselves from the UAW-CIO, charging that they were "sighted" in new contract negotiations.

Although the group already has formed as the Society of Industrial Skilled Trades of North America, it does not actually have any bargaining rights as a separate entity. The group cannot file a petition for withdrawal from the UAW until 60 to 90 days before the new contracts with the automobile companies expire in June, 1958.

Meanwhile, the union local in South Bend, Ind., was threatening to take "some kind of action" against Studebaker-Packard Corp. following the company's announcement of an indefinite layoff of 1700 hourly rated workers. The company said the layoff resulted from the recent installation in the plant of new work standards which reduced manpower needs.

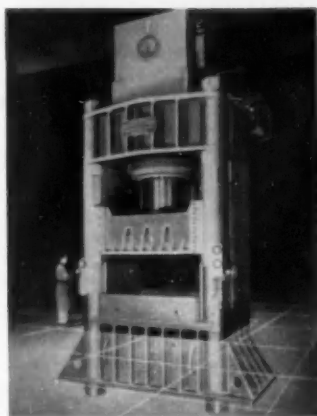
The layoff reduces the work force at the South Bend plant to approximately 9000 persons. The company claims, however, that it still will be able to turn out the same number of cars as normally before the layoff because of the installation of new machinery and rearrangement of other machines to improve efficiency.

### Glass Manufacturing Operation To be Built by Ford in Tenn.

Ford will construct a new one million sq ft glass manufacturing plant near Nashville, Tenn., as part of its \$2.3 billion postwar expansion program. The new plant, scheduled for operation in 1957, will add materially to the company's present glass manufacturing facilities.

Located on a 250-acre site, the facilities will include a 850,000 sq ft manufacturing building, two-story employee services and administration building occupying more than 100,000 sq ft of space, and an adjacent powerhouse and water cooling tower, which will take up an additional 120,000 sq ft of area. When completed, the plant will employ about 2500 persons.

# AND AVIATION INDUSTRIES



## H-P-M METALWORKER

This heavy-duty H-P-M metalworking press with a 3000-ton capacity was recently shipped to the new Caterpillar Tractor Co. plant at Decatur, Ill. It has a 1000-ton die cushion and a pressing area of 96 in. by 96 in. Size of die cushion platen is 76 in. by 65 in., and die cushion stroke is 18 in. Weight of entire unit is 574,800 lb., according to the company.

## Chrysler Confirms Report Of Plan To Buy Supplier

Chrysler officially has announced that it plans to buy Universal Products Co., Inc., Dearborn, Mich., one of its chief suppliers (See AI, July 15, p. 37). Still subject to approval by Universal's stockholders, the purchase would give Chrysler 300,000 sq ft of additional floor space which Universal owns on 14 acres in Dearborn.

The purchase price of \$3 million to \$3.5 million would include, in addition to plants, all Universal equipment and inventories, with the transaction expected to be completed within four months. Universal manufactures automotive drive shafts, and components, including universal joints. In recent years, the company has been supplying about 85 per cent of its output to Chrysler.

Chrysler has reportedly not yet decided whether it will operate the company as a subsidiary with a change in name or whether the name will be retained. When Chrysler purchased the Briggs assets, those facilities became the Automotive Body Div. of Chrysler Corp.

# AI TABLOID

General Motors dealers in major Canadian markets will now handle only one line of cars instead of a plural number.

Micro Switch Div. of Minneapolis-Honeywell Regulator Co. now has touring the country a rolling display van containing its latest precision switches.

Sikorsky Aircraft Div. of United Aircraft Corp. has placed its 12-passenger S-58 helicopter on the commercial market.

Electric Auto-Lite Co. is building a 52,000 sq ft addition to its Port Huron, Mich., wire and cable plant. . . . Timken Roller Bearing Co. is undertaking a \$850,000 expansion of facilities of its Bucyrus, O., plant. . . . Moog Valve Co. is launching its third expansion program since the first of the year.

Parker Rust Proof Co. has developed a new material known as Parker Pre-Namel 410 that is said to be the key to a new method for the application of the porcelain enamel finish coat directly to ferrous metals.

Leyland Motors, Ltd., has acquired Scammell Lorries, Ltd., specialized commercial vehicle manufacturer.

Boeing Airplane Co. has been authorized by the Air Force to build a commercial transport version of the KC-135 jet tanker. . . . Temco Aircraft Corp. has been awarded a subcontract to provide titanium alloy parts for the F-100 Super Sabre jet plane.

Kaman Aircraft Corp. has established a new Military Operations Research Dept.

Rolls-Royce, Ltd., is to produce Hydro-Dynamic torque converter transmissions of Twin Disc design under license.

Dow Chemical Co. now has its new Freeport, Tex., plant in full commercial production of polyethylene molding and extrusion materials.

American Wheelabrator & Equipment Corp. has moved its Detroit district sales office to 13504 Fenkell Ave. . . . Hall Industrial Publicity, Inc., has moved to expanded quarters at 23704 Woodward Ave., Pleasant Ridge, Mich.

Bogue Electric Manufacturing Co. is making what is said to be a new type of variable speed, alternating current motor for industrial use.

ACF-Brill Motors Co. has bought a half interest in the Detroit super-market chain of Wrigley Stores.

Piasecki Aircraft Corp. is name of new company formed by Frank N. Piasecki, former chairman of Piasecki Helicopter Corp. Stated purpose is "to furnish and supply engineering, research, planning, and development service of all kinds."

Rheem Manufacturing Co. has entered the reconditioned drum field.

Napeo Industries, Inc., has purchased the assets, plant facilities, manufacturing rights, and patents of Highway Safety Appliances, Inc. . . . Textron American, Inc., has bought Homelite Corp. . . . Nopco Chemical Co. has acquired the assets of Griffin Chemical Co.

# News of the AUTOMOTIVE

## SMALLER TRUCK MAKERS SHOW MARKET SHARE GAINS

### 1955 New Truck Registrations\*

Arranged by Makes in Descending Order According to the 1955 Five Months' Totals

MAKE	May 1955	April 1955	May 1954	FIVE MONTHS		Per Cent of Total	
				Units	1954	1955	1954
Ford	24,630	27,993	25,900	115,960	113,377	33.70	32.61
Chevrolet	29,563	24,965	27,071	105,315	120,824	30.60	34.79
International	8,845	9,334	7,749	42,145	34,856	12.24	9.97
Dodge	5,214	5,028	5,500	25,959	26,050	7.54	7.49
G. M. C.	6,989	4,691	6,221	24,356	29,942	7.96	9.61
Willis Truck	1,361	1,471	685	6,051	2,529	1.93	.73
White	1,173	1,239	1,001	5,370	5,142	1.56	1.48
Studebaker	1,061	1,129	1,034	4,803	4,657	1.40	1.34
Mack	1,061	1,000	595	3,941	2,434	1.16	.76
Willis Jeep	785	835	634	3,609	3,024	1.11	.57
Diamond T	312	327	261	1,405	1,161	.41	.34
Oliver	349	269	215	1,328	1,045	.39	.30
Reo	232	297	198	1,050	1,010	.31	.29
Brookway	85	94	106	451	504	.12	.08
Kearworth	53	87	75	399	262	.13	.14
Peterbilt	46	44	42	169	145	.05	.04
F. W. D.	22	18	68	97	220	.03	.06
Federal	4	3	24	19	172	.01	.05
Misc. Domestic	37	64	52	267	309	.08	.08
Foreign	157	190	19	565	79	.16	.02
Total—All Makes	82,086	79,071	76,209	344,108	347,681	100.00	100.00

\* Based on data from R. L. Polk & Co.

## Leyland Commercial Vehicles Will be Built Soon in India

Leyland Motors, Ltd., has formed a new company in India for the progressive manufacture there of its commercial vehicles and Diesel engines. Ashok Leyland, Ltd., at Ennore, 10 miles north of Madras, will initially concentrate on producing 90-hp Comet trucks and buses.

It is stated that the heavier models

may be introduced later, and that types developed specially for the Indian market may follow. Machine tools, jigs, and other equipment valued at \$280,000 have already been ordered.

Leyland will be the only builder and distributor in India of Diesel-engine vehicles rated at over 10 tons.



Sensitive electronic instruments play a vital role in full-scale crash tests at Ford Engineering Staff's Dearborn test track. They are part of a concerted Ford safety program, which has resulted in the availability of seat belts as a dealer-installed optional accessory on the company's line of vehicles. Here, a technician adjusts an electrical connection leading from a patch of aluminum foil on head of a crash dummy. If foil makes contact during a crash, it closes a circuit to produce a signal in instrument van to record time and force of the impact.

## Studebaker-Packard Forms New Defense Product Unit

Another significant move has been made by Studebaker-Packard Corp. in its program of basic development of key defense products with the formation of a new division to co-ordinate Government and industrial products programs. General manager of the new unit will be George H. Brodie, who will direct engineering, procurement and manufacturing.

## Seat Belts Offered by Ford For Automobiles and Trucks

Ford is the second automobile manufacturer to make seat belts available as a dealer-installed accessory. They will be offered on Ford, Lincoln, and Mercury cars, and Ford trucks at a suggested list price of \$11.95, excluding installation cost. Chrysler previously announced it would make seat belts available.

Ford for some time has been conducting extensive research on the effects of car crash injuries with the use of anthropomorphic dummies that have maximum human characteristics. Although there is still some argument about the feasibility of safety belts, Ford believes there is less chance of injury when the motorist is held in his seat by a belt.

The company has actually crashed cars at its Dearborn test track and smashed them with battering rams to learn how much they can take in collisions. Dummies ride in both the front and rear seats.

Ford engineers state that some safety belts can do more harm than good if they are improperly designed and constructed. The belt designed by Ford consists of a two-in.-wide nylon-rayon webbing and buckles anchored to a steel plate under the floor.

In the Ford crash tests, sensitive electronic instruments attached to the manikins record the force of blows they sustain in a crash and transmit them from the car to equipment in nearby vans. The extent and nature of damage and positioning of the manikin after the crash has helped Ford to garner some significant research information, which led to the decision to offer safety belts.

# AND AVIATION INDUSTRIES

## Turboprop Engine Contract Is Awarded To Allison Div.

A \$50 million contract for production of T-56 turboprop aircraft engines has been awarded to the Allison Div. by the Air Force. Under the contract, Allison will start producing the engines next April. The engines are designed for the Air Force's YC-130 military transport plane.

## Atomic Parts Production Unit Is Unveiled by Westinghouse

Westinghouse Electric Corp. last month unveiled the first privately-financed factory designed to produce parts for atomic power plants. The plant is located in Cheswick, Pa.

During a special tour through the multi-million dollar installation, members of the press saw machinists manufacturing "canned" motor-pumps that send radioactive fluids through the hermetically-sealed systems of nuclear power plants.

At the same time, it was announced that Westinghouse has constructed within this factory a high pressure "proving ground." It is designed expressly for the full-scale testing of canned motor-pumps and valves used in nuclear power plants and atomic power systems.

The new pump testing facility, or "test loop" as it is called, is believed to be the largest of its kind in the world. It is capable of testing equipment at very high pressures, temperatures, and capacities.

### Wondrous Pumps in "Cans"

The canned motor-pump—first product to be manufactured at the 87,000 sq ft Cheswick plant—is unique in that the pump impeller and its electric drive motor are encased within a single pressure-tight vessel. Then, the fluid being pumped circulates throughout the motor, through its bearings, about its rotor, and around its sealed stator.

The stator windings are protected from the hot fluid by jacketing the ends and outside diameter in stainless steel and then lining the inner bore with a cylinder or "can" of thin nickel alloy sheet, welded leak-tight at each end. The outer surface of the rotor is

## FORD HOLDS LEAD AS CHEVROLET GAINS MORE IN MAY

### 1955 New Passenger Car Registrations\*

Arranged by Makes in Descending Order According to the 1955 Five Months' Totals

MAKE	FIVE MONTHS							
	Units				Per Cent of Total			
	May 1955	April 1955	May 1954	1955	1954	1955	1954	
Ford	137,192	136,502	127,523	600,913	537,807	21.14	24.22	
Chevrolet	149,948	139,527	132,966	593,411	545,624	20.09	24.50	
Buick	71,250	71,127	51,534	311,806	206,636	10.90	9.32	
Plymouth	62,653	63,539	38,184	280,239	173,652	9.87	7.02	
Oldsmobile	53,637	53,288	42,620	236,781	180,891	8.34	6.99	
Pontiac	46,746	46,599	32,872	219,732	147,608	7.58	6.64	
Mercury	34,360	32,834	24,794	142,200	124,484	5.01	5.61	
Dodge	26,498	28,174	13,886	120,985	64,266	4.26	2.89	
Chrysler	14,874	15,311	9,288	70,230	46,765	2.47	2.11	
Cadillac	12,922	13,072	10,736	62,317	42,077	2.19	1.90	
De Soto	11,195	11,784	6,490	51,584	33,837	1.82	1.53	
Studebaker	9,596	10,017	7,562	43,700	29,796	1.54	1.79	
Nash	10,085	9,793	7,871	36,620	24,823	1.29	1.57	
Packard	5,533	5,736	3,065	21,453	19,572	.76	.88	
Hudson	4,798	5,086	2,729	18,769	13,373	.66	.60	
Lincoln	3,042	2,755	3,460	12,267	15,993	.43	.72	
Willys	708	850	1,814	3,785	7,796	.13	.35	
Kaiser	64	122	968	716	3,903	.03	.18	
Misc. Domestic	28	16	385	176	1,683	.01	.05	
Foreign	4,195	3,807	2,166	16,801	9,108	.50	.41	
Total—All Makes	661,304	651,656	520,958	2,840,532	2,220,061	100.00	100.00	

\* Based on data from R. L. Polk & Co.

"canned" in a similar manner.

At Cheswick, canned motor-pumps currently in production range in size from ½ hp or five gpm up to 300 hp or 4000 gpm. They weigh anywhere from 60 lb to nearly 7000 lb.

Whether a canned motor-pump is large or small, its manufacture requires extreme precision. Some parts

are worked to tolerances of five millionths-of-an-inch. The rotating portion of every canned motor-pump is so delicately balanced that the removal or addition of a few grains of metal would throw it out of balance.

Continued on Page 96

## 1955 RETAIL CAR SALES BY PRICE GROUPS\*

### Number of Cars

Price Group	May				Five Months			
	1955		1954		1955		1954	
	Units†	% of Total	Units†	% of Total	Units†	% of Total	Units†	% of Total
Under \$2,000	360,908	54.88	309,563	59.65	1,532,492	53.80	1,393,128	56.95
\$2,001 to \$2,500	209,872	31.34	130,956	25.25	895,210	31.42	571,996	25.87
\$2,501 to \$3,500	71,635	10.90	58,282	11.24	335,296	11.77	241,777	10.94
Over \$3,500	18,889	2.87	19,874	3.83	85,830	3.01	93,831	4.24
Total	660,975	100.00	518,675	100.00	2,848,796	100.00	2,210,732	100.00

### Dollar Volume of Sales

Price Group	May				Five Months			
	1955		1954		1955		1954	
	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under \$2,000	\$663,918,063	47.41	\$663,243,980	51.21	\$2,988,886,130	48.19	\$2,372,888,625	50.47
\$2,001 to \$2,500	490,121,785	33.20	300,127,199	27.29	2,066,734,030	33.16	1,307,307,139	27.81
\$2,501 to \$3,500	202,135,622	14.01	186,240,280	14.47	951,508,190	19.10	660,008,950	14.06
Over \$3,500	76,465,090	5.38	77,506,496	7.04	340,834,908	6.65	360,823,880	7.67
Total	\$1,442,639,740	100.00	\$1,267,111,915	100.00	\$6,296,970,231	100.00	\$4,701,028,577	100.00

\*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four-door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American-made cars only. Does not include imported foreign cars.

# HOW WE QUADRUPLUED TOOL LIFE—and cut tool cost 75%

—as told by George Edgar,  
Foreman, D. O. James Gear  
Mfg. Co., Chicago, Ill.

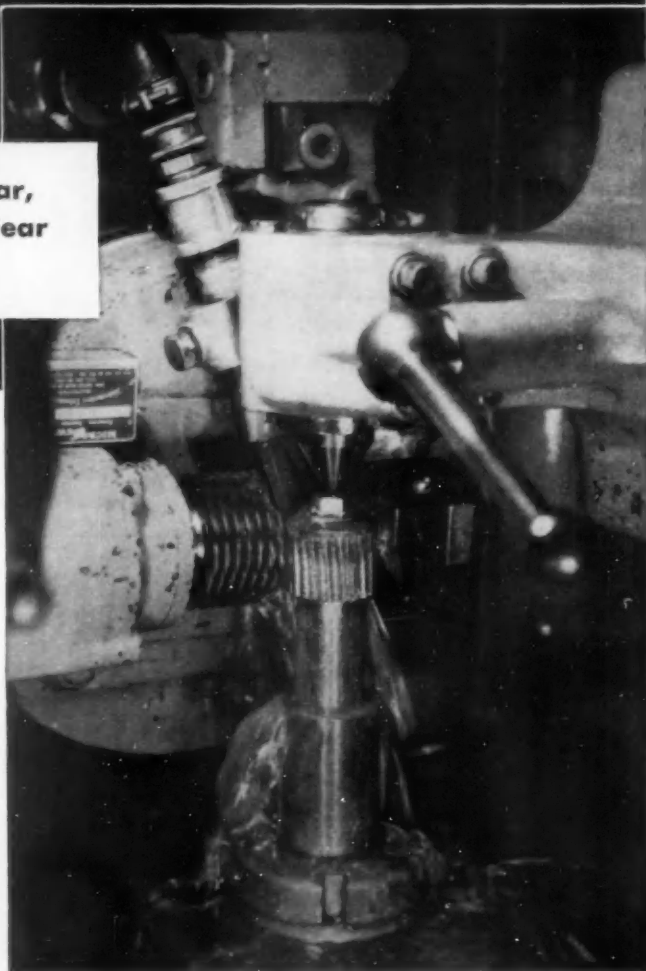
"**THE JOB** was hobbing a small helical gear," says Mr. Edgar. "With the cutting oil we have been using we averaged about 125 gears between resharpenings after using the full face of the hob."

"A Texaco Lubrication Engineer offered to help us do better. On his recommendation, we changed to *Texaco Transultex Cutting Oil B* and found we could run 500 gears before hobs had to be sharpened. This gave us four times the tool life and cut our tool costs on this job by 75 per cent."

Everywhere, *Texaco Cutting, Grinding and Soluble Oils* are helping to machine faster, better and at lower cost—regardless of the metal being cut or the method of machining it.

Let a Texaco Lubrication Engineer help you gain these benefits for your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



#### JOB DATA

Steel	AISI 4140	No. of teeth	19
Hardness	Re 30-35	Diam. Pitch	12.037
Diameter	1.75"	Hob Diam.	3.50
Face	0.75"	RPM	110
Shape	Helical	Feed	0.070"

SFPM 101



## TEXACO

CUTTING, GRINDING,  
SOLUBLE AND  
HYDRAULIC OILS

TUNE IN... TEXACO STAR THEATER starring JIMMY DURANTE or DONALD O'CONNOR on television... Saturday nights, NBC.

# Men in the News



Dodge Div., Chrysler Corp.—Harold C. Cook is now purchasing agent.



Vickers, Inc.—Harry F. Vickers and Kenneth R. Herman have been elected vice-chairman of the board and president, respectively.

Eaton Mfg. Co.—Howard J. Findley was made assistant director of engineering.



Studebaker-Packard Corp., Government and Industrial Div.—O. E. Rogers is now assistant general manager and chief engineer; O. E. Enders, assistant to the vice-president; Earl M. Douglas, general manufacturing manager; D. H. Hartman, manager of contract administration; and H. W. Robinson, manager of contract coordination.

Heintz Manufacturing Co.—John H. Thacher has been made secretary.

Chrysler Corp., Export Div.—C. N. Galer is now director of Forward Planning.

Atkins Saw Div., Borg-Warner Corp.—Carl J. Meister has been named executive vice-president and assistant general manager; Robert M. Zimmerman, vice-president of manufacturing; and Howard O. Wiesen, vice-president of administration.

American Bosch Div., American Bosch Arma Corp.—John H. Flaskammer has been advanced to vice-president of sales.

Stewart-Warner Corp., Electronics Div.—Lloyd T. DeVore has been named general manager.

Westinghouse Electric Corp., Electronics Div.—D. R. Tashjian has been appointed manager of engineering.

Jack & Heintz, Inc.—Ralph J. Eschborn has been named chief engineer.

Trailmobile, Inc.—Kent S. Snyder has been named advertising manager.

Reo Div., Motor Wheel Corp.—L. C. Vandertill is now sales manager.



Vickers, Inc.—N. E. Edlerson has been elected vice-president for engineering.



Studebaker-Packard Corp., Government and Industrial Div.—George H. Brodie has been named vice-president and general manager.

Great Lakes Stamping & Mfg. Co.—George Pinkus was elected president, succeeding V. E. Snyder, who will remain as a consultant. Other officers elected were B. J. Secor and A. R. Pass, vice-presidents; Henry Block, secretary; and Howard Pinkus, treasurer. B. Z. Ranan was appointed general manager in charge of manufacturing.

(Turn to page 100, please)



Warner Electric Brake & Clutch Co.—Norman K. Anderson was promoted to vice-president for sales, and King DeSeve was named vice-president for operations.

## Necrology

Frank B. Stearns, 76, manufacturer of the old Stearns-Knight automobile, died July 5, at Cleveland, O.

Robert H. Crooker, 61, former advertising manager of the old Chalmers Motor Car Co. and Chevrolet Div. of General Motors, died July 8, at Los Angeles, Calif.

Thayer B. Haskins, 44, senior cost analyst in the general offices of Fisher Body Div. of General Motors Corp., died recently, at Detroit, Mich.

John N. Fauver, president of J. N. Fauver Co., Inc., died July 6, at Detroit, Mich.

Harold T. Dow, 65, former president of Spring Perch Co., died July 9, at Buffalo, N. Y.

Charles L. Amos, 75, organizer and founder of the present Owen-Dyneto Div. of Auto-Lite Battery Corp., died recently, at Syracuse, N. Y.

Joseph C. Teetor, 82, one of the founders of Perfect Circle Corp., died July 10, at Indianapolis, Ind.

William F. Zimmerman, 71, executive vice-president and a director of Gould & Eberhardt, Inc., died July 9, at East Orange, N. J.

Wallace H. Simila, 63, retired master mechanic of Plymouth Div., Chrysler Corp., died July 3, at Detroit, Mich.

Robert L. Kreus, 51, Michigan representative for Western Felt Works and Acadia Synthetic Products, died July 4, at Birmingham, Mich.



Another Reason So Many People Insist  
on B&W Mechanical Tubing

## EVERYBODY WINS IN THIS GAME OF "SPIN THE BOTTLE"

Hoke, Inc., of Englewood, N. J., makes sampling bottles for the chemical process industries — to carry and contain a wide variety of fixed or liquefied gases, many of them highly corrosive. From the start of its operation in 1949, Hoke has insisted on B&W seamless stainless steel tubing, to be spun into bottles, in preference to competitive methods of deep-drawing or cold extrusion. Valves are attached at either or both ends.

The uniform wall thickness and concentricity characteristic of B&W stainless tubing contribute to the safety factor for which Hoke spun

bottles are famous. Because Hoke uses short lengths of tubing, its quality control people have the advantage of 100 per cent inspection of the tubing stock used. Higher standards of cleanliness and safety are possible because of the uniform mechanical properties of the stainless tubing, and Hoke's automatic spinning operation (10 to 15-second production time cycle).

Whatever your requirements — carbon, alloy or stainless — you can do better with always-uniform B&W tubing. Get in touch with Mr. Tubes, or write for *Technical Bulletin 365 AI*.



**THE BABCOCK & WILCOX COMPANY  
TUBULAR PRODUCTS DIVISION**

Beaver Falls, Pa. and Milwaukee, Wis.:  
Seamless Tubing, Welded Stainless Steel Tubing  
Alliance, Ohio: Welded Carbon Steel Tubing  
Milwaukee, Wis.: Seamless Welding Fittings

TA-5006(M)



SPIRAL BEVEL GEARS



HYPOID BEVEL GEARS



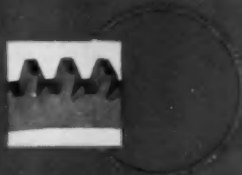
ZEROL BEVEL GEARS



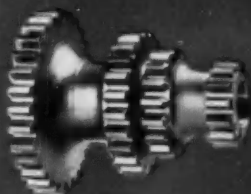
STRAIGHT BEVEL GEARS



ANGULAR BEVEL GEARS



FLYWHEEL RING GEARS



SPUR GEARS



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SPLINE SHAFTS



GEAR ASSEMBLIES

Through 40 years of gear making, these are the 10 gear types that have emerged as our specialties.

If one (or more) of these types is included in your product, it may pay you to review the facts about Double Diamond Gears contained in this book.

We will be happy to send you a copy. Why not write for one today?



FOR AUTOMOTIVE, FARM EQUIPMENT  
& GENERAL INDUSTRIAL APPLICATIONS  
GEAR-MAKERS TO LEADING MANUFACTURERS

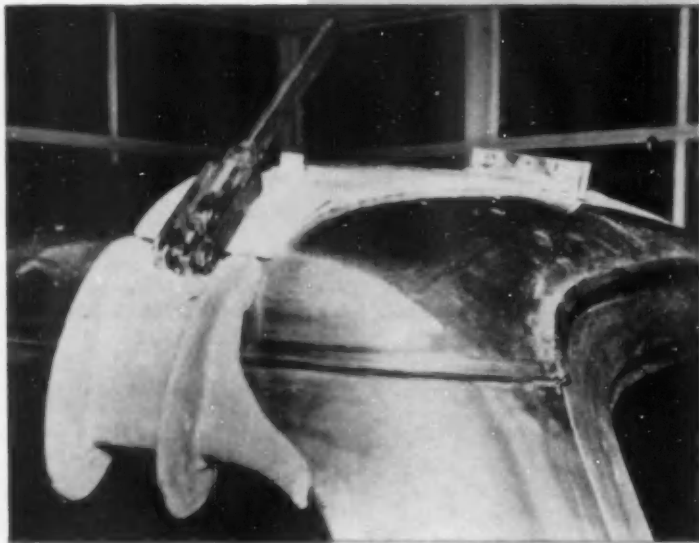
# Automotive Gear Works, inc.

ESTABLISHED IN 1914

RICHMOND, INDIANA



Tooling time cut **50%**  
with compounds based on  
**BAKELITE**  
TRADE-MARK  
**Epoxy Resins**



**REZOLIN Toolplastik Compound** was cast against a finished body to form this spot welding jig. Time: only 21 hours compared with 45 to 80 needed to make one of conventional materials. Based on BAKELITE Epoxy Resin, this tooling compound is produced by Rezolin, Inc., Los Angeles 45, Calif.

Now metalworking tools can keep up with fast model changes. Less time, lower costs result because BAKELITE Brand Epoxy Resins offer these advantages:

- Liquid compounds—can be cast to shape without pressure
- Cured at room temperature—no applied heat
- Minimum shrinkage—minimum finishing
- Excellent flexural, compression, and impact strengths
- Outstanding dimensional stability
- Light weight means easy handling
- Laminated with glass cloth to form jigs, spotting racks, fixtures, and Keller models.

For further information, write Dept. JU-4.



**BAKELITE COMPANY**, A Division of Union Carbide and Carbon Corporation **UCC** 30 East 42nd Street, New York 17, N. Y.  
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario  
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

# LOW COST WAY TO SEAL ROAD DIRT AND MOISTURE FROM AUTO BODY HOLES

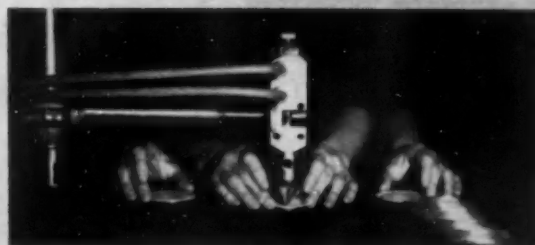
Suppliers to the automotive industry have found a way to save their customers thousands of costly man-hours in assembly, by using DAREX "Flowed-In" gaskets.

The problem was to seal body holes for auto trim against seepage of moisture and road dirt . . . and at the same time cut production time and costs. Dewey and Almy engineers recommended the addition of an integral gasket to the washer-nut fastener by the "Flowed-In" process, using DAREX "H637 Compound". This unique

fluid gasketing material flows on, cures in 20 seconds without shrinkage, and forms a perfect, rubbery seal that stays in place, is clean to handle and free from distortion.

The recommendation was adopted. The result: auto assembly lines are now fastening chrome trim with single unit fasteners . . . nut, washer and sealing gasket, all in one piece. Production is much faster . . . the finished job is neater, better and far less costly than before.

Interested? Mail coupon below for complete facts.



This illustration shows gaskets being flowed in place on a DAREX semi-automatic machine. The operator has only to feed with one hand, clear with the other. Automotive manufacturers are using machines like this one as well as high-speed, fully automatic DAREX equipment to gasket a wide variety of parts, including: washer-nut assemblies, covers for oil filters, air cleaners, oil pans, crankcases, transmission housings, overhead valve covers and shock absorbers.

Discover how DAREX "Flowed-In" gaskets can cut costs for you!

## "H637 COMPOUND"

Base: Vinyl	Sealing: Against water, dust, dirt	Adhesion to metal: Excellent, no primer coat needed	Torque retention: Excellent
Staining: No migration staining	Temperature resistance: -20° to 250°F.	Aging: Excellent	Color: Gray
Consistency: (Wet) Non-slumping paste—(Dry) Rubbery	Production rates: Semi-automatic—25 per minute; Automatic—150 per minute		
Curing time: 20 seconds, no shrinkage	Uses: Wherever integral nut, washer, gasket assemblies are used as a hermetic seal		



**DEWEY and ALMY**  
Chemical Company

DIVISION OF W. R. GRACE & CO.  
Cambridge 40, Massachusetts

Last year, over 100 billion DEWEY and ALMY gaskets were applied in various industries throughout the world. In the automotive industry, they are being increasingly used to save time and money, and help make better cars.

# MERCURY

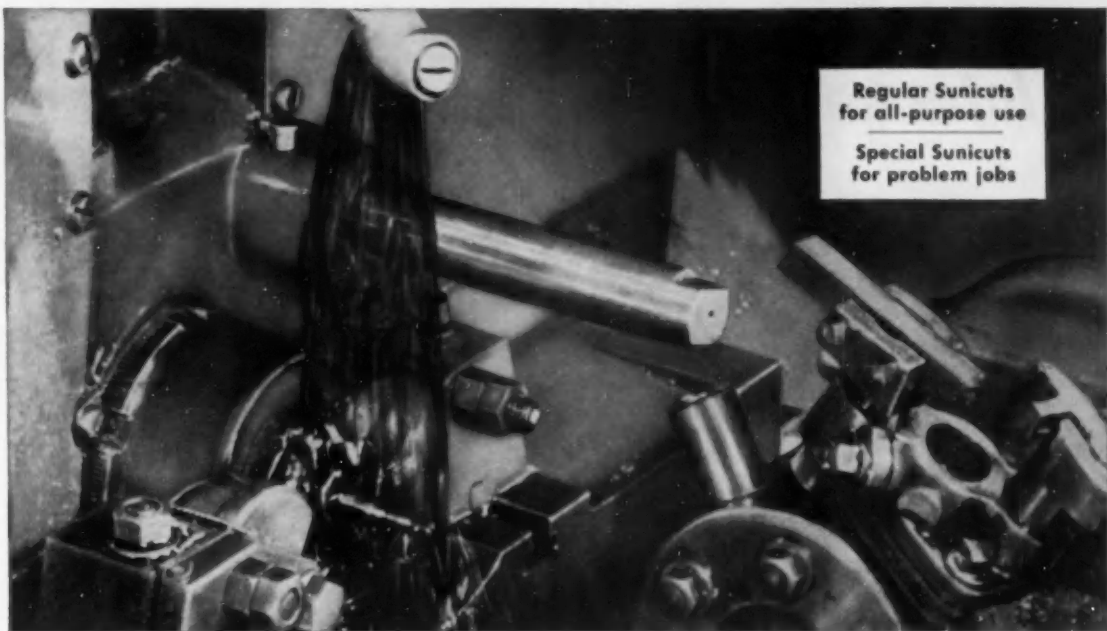
...like many  
other leading engine manufacturers  
selects and distributes...for  
authorized replacement service...



## Perfect Circle

2 in 1 chrome piston rings...the  
standard of comparison!





to assure peak production...

## **THERE'S A SUNICUT OIL FOR EVERY SCREW MACHINE OPERATION**

Today's Sunicut cutting oils are the result of years of research and on-the-job testing. And they're versatile, too. In many plants *all* screw machine jobs are being handled by a single Sunicut grade.

For the problem jobs, Sun makes a wide variety of special Sunicut oils, each designed to do the job better.

Your Sun representative has the practical know-how to analyze *your* problems. Working with Sun's experienced engineering staff, he's ready to help you pick the Sunicut oil that will give you the tolerances and finishes you want.

The Sunicut series for screw machines is only part of a large selection of non-emulsifying and emulsifying cutting oils available to help you get peak production at the lowest possible cost.

For complete information about Sun cutting oils see your Sun representative... or write Sun Oil Company, Philadelphia 3, Pa., Dept. AA-8.



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# International Aeronautical Conference

**A**ERONAUTICAL scientists, engineers, technical and management executives from all over the Free World came to Los Angeles for the Fifth International Aeronautical Conference. The four-day late-June conclave was held on the West Coast for the first time. One thousand attended.

The joint meeting of the Institute of Aeronautical Sciences and the Royal Aeronautical Society (Great Britain) drew about 130 foreign delegates. Britain sent a virtual "Who's Who" of aircraft people in government, military, and commercial fields. Most of them stayed on an extra week or so to visit aircraft plants in the U. S.

Delegates heard 18 technical papers on latest research advances in high-speed aerodynamics, aircraft structures, jet engines, control systems, aircraft design, and operation.

As IAS president, Robert E. Gross, Lockheed Aircraft's president, welcomed the delegates. Here are a few highlights from his talk:

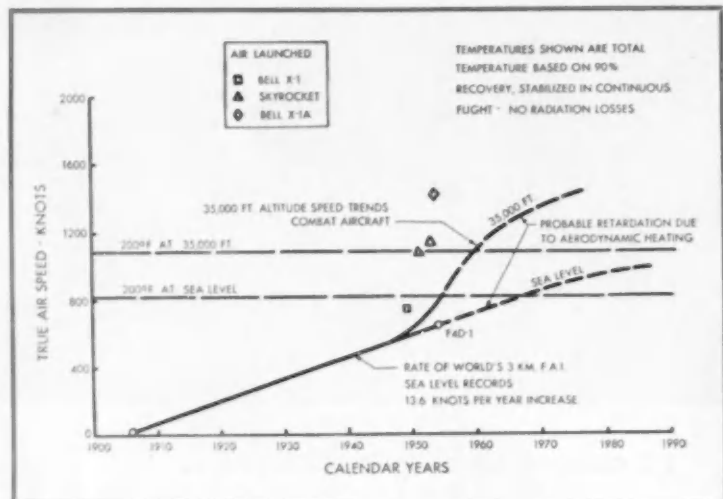
"... Engineering capability is the most precious element in the whole aeronautical apparatus and mastery of the air is being recognized more and more as the trump card at the conference table for world peace. ...

"... We can't merely whistle through our fingers and have a whole complement of engineers at our gates just when we need them. ... We must resign ourselves to the fact that we are not going to get many more new engineers now. We must make better use of the men we have today. ...

"Somehow I have the feeling if we could get a better, simpler, and different approach even by our military and naval friends to developing new types of planes, we might astound ourselves and then, too, as to what we could do with the people we now have. ..."

RAS President Norbert E. Rowe, technical director of Blackburn & General Aircraft, Ltd., Brough, East Yorks, England, paid tribute to the wonderful spirit of cooperation between the U. S. and British groups.

For outstanding achievement in aeronautical devel-



Airplane high speed vs time (E. H. Heinemann)

opment, Dr. Karl Gottfried Guderley, Wright Air Development Center, Dayton, O., got the Thurman H. Bane Award.

Maj. Gen. Albert Boyd, commanding officer, WADC, received the Octave Chanute Award for a pilot who made a notable contribution to aeronautical sciences.

Abstracts of some important papers:

"Design of High Speed Aircraft"—by E. H. Heinemann, chief engineer, Douglas Aircraft Co., Inc., El Segundo, Calif. ...

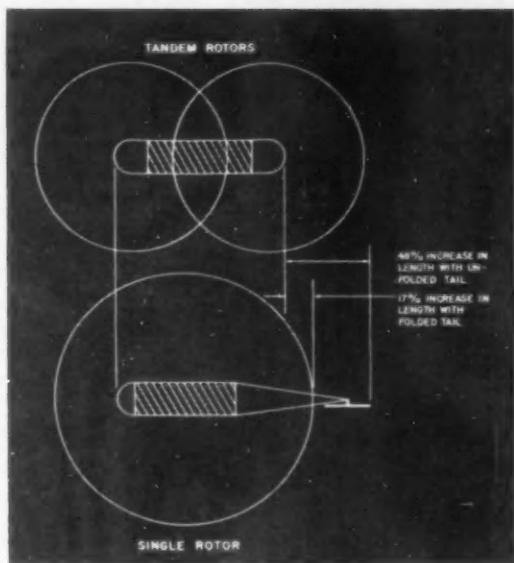
Keep it light, simple, and reliable. Regardless of the airplane's mission, that's the most outstanding rule for the aircraft designer.

Development of high speed aircraft during recent years is presenting the aircraft designer with many new problems: thrust and drag requirements, stability and control, maneuverability, buffet limit, and thermal limitations.

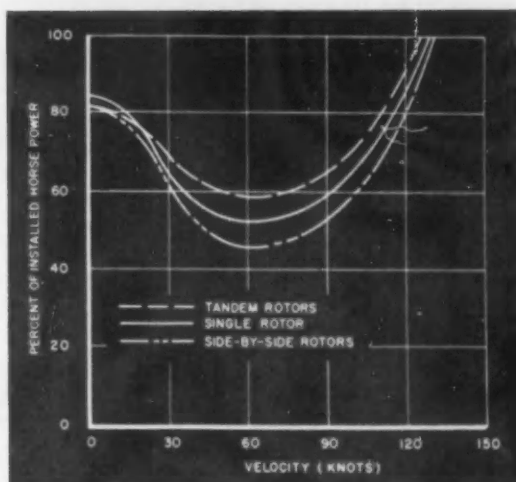
Mr. Heinemann distinguished between the airplane as an airborne vehicle flying within the earth's atmosphere and thrust borne vehicles that have ballistic trajectories. Although speed in the upper atmosphere with rocket power plants is practically unlimited, the airplane has some very distinct operational limitations.

"Design of Large Helicopters"—by Bartram Kelley, chief helicopter engineer, Bell Aircraft Corp., Fort Worth, Texas ...

# Concentrates on Research Progress



Comparison of proportions for single and tandem rotor configurations: Equal gross weights cargo area and disk area (Bartram Kelley)



Comparison of speed-power polars for three rotor configurations (Bartram Kelley)

— By R. Raymond Kay —

Mr. Kelley gave a broad study of the growth of the present-day helicopter rotor with particular emphasis on disk loading.

In a general discussion of rotor parameters, he linked together power requirements for hovering flight, tip speed, and average lift coefficient. The treatment was not directed exclusively at helicopter technicians, but to any member of the aircraft industry interested in the broader aspects of preliminary design.

Mr. Kelley limited his presentation to torque-driven rotors, and excluded jet helicopters and convertiplanes.

After discussing disk loading, lift coefficient, and tip speed—and assuming these qualities to be held constant—he introduced elementary formulae to show the effect of increasing the rotor diameter. He concluded from the way diameter affects lift, power, torque, blade weight, and centrifugal force, that there must be an optimum size beyond which further increases are not profitable and, therefore, two or more rotors should be used for larger helicopters.

In comparison with the growth of the airplane

wing, the helicopter presented a different problem. The old monoplane vs biplane argument was also ruled out as having no analog in helicopters.

To substantiate the statements on blade weight, seven different Bell Aircraft see-saw rotor designs were algebraically collated in such a way to bring out the effects of diameter. Data on transmission weights were also included.

Since a maximum, practical rotor diameter is believed to exist, Mr. Kelley delved into multi-rotor configurations. He presented power-required curves for the purpose of comparing single-rotor, tandem, and side-by-side arrangements.

Three basic conclusions were reached by the Bell engineer:

1. The single rotor plus tail rotor configuration is best for small helicopters.
2. The tandem is best for medium or light transports, especially where cruise economy is not important.
3. The side-by-side configuration is clearly superior for large twin-engine transport types.

"Power Control Systems for Aircraft"—by J. W. Ludwig, staff engineer, Controls and Hydraulics,

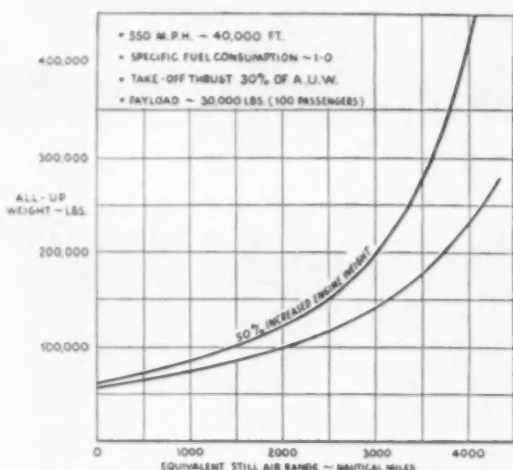
Chance Vought Aircraft, Inc., Dallas, Texas . . .

As airplanes have developed, the reliability of the control system first increased and then, in later years, decreased. This trend has been brought about by the increase in design requirements. For adequate airplane reliability, this trend must be reversed. Possible improvements in design simplicity are possible if the controls designer recognizes the entire problem at the outset, and is able to approach it as a single problem rather than an agglomeration of separate ones.

Design improvements in control servos should lead to sizable weight and cost reductions. These developments should be adequately supported by statistical reliability test programs. If the confidence level of the designer is to be sufficiently high, these programs will be much more extensive than is presently the practice. The flight test phase of control system development is the final step and an understanding of the pilot's characteristics must exist if this program is to be planned properly so that valid test results will be obtained.

"Combustion for Aircraft Engines"—by W. T. Olson, chief, Fuels and Combustion Research Division, National Advisory Committee for Aeronautics, Cleveland, Ohio . . .

Combustion problems for turbojets, afterburners, and ramjets arise from two factors: (1) the extreme range and rapid variations of operating conditions encountered, and (2) the many requirements of the combustor, some of which necessitate compromises in the design. Main things the designer must achieve are efficient, high heat-release rates, low pressure drop, suitable outlet temperature profile, and reliability. Reliability includes: durability, easy ignition, and rapid response to changes. The literature on the basic processes and phenomena in aircraft-engine combustors is large and growing. This information, coupled with direct engineering experience, has pro-



Effect on aircraft weight of change in engine specific weight (Adrian A. Lombard)

vided design ideas and insights that assist in meeting the advancing needs of the art.

High combustion efficiency is increasingly hard to get at the high velocities imposed by high mass flow engines; it is also affected adversely by the low pressures at high altitudes. Several basic facts about combustion make it evident that three things are required for high combustion efficiency in a high-speed combustion system: (1) preparation of mixtures that fall within a narrow range of composition near stoichiometric, (2) sufficient time and temperature in order to bring the incoming charge to ignition or flame conditions, and (3) adequate time and space or volume for the turbulently burning mixture to burn completely. In afterburners and ramjets, basic information for fuel spreading and evaporation assists the problem of matching fuel distribution to air flow to obtain proper mixtures at the flame stabilizers.

Pressure loss can be calculated, as can air flow distribution, along can type combustors.

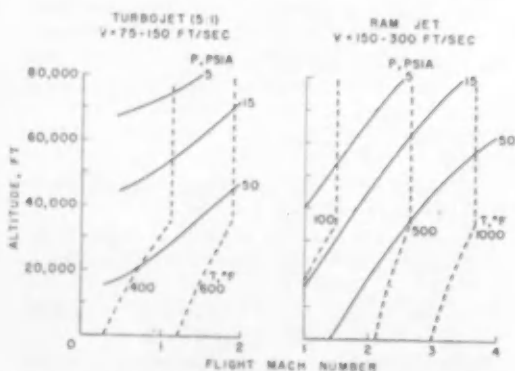
Data on jet penetration and mixing provide only approximate answers to the problem of obtaining a desired combustor-outlet temperature profile. There is still much artistry connected with this subject.

Combustor wall cooling is more difficult when wall temperatures are increased by increases in both convection and radiation at high pressure and temperatures. Carbon deposits, which increase with fuel rates, reflect strongly the quality of the fuel.

High ignition energies are required, but the energy is influenced strongly by the local environment around the ignitor, and somewhat by the fuel volatility.

The value of research on isolated problems or processes will only be secured when all the problems are solved together. The inevitable design compromises

(Turn to page 114, please)



Typical combustor inlet-air conditions (Walter T. Olson)

# Early Preparations for the **BIG SHOW**

**B**EARING out advance predictions that the Machine Tool Show, September 6-17, in Chicago would feature much heavier equipment than had ever been assembled under one roof, some 523 machines are of a size and shape that require more than ordinary skilled handling. As a consequence plans called for the importing of additional trained machinery riggers from Detroit, Cleveland and other industrial centers. One of the largest machines to be put on display was installed early in July in the International Amphitheatre, ready for operation, according to a statement by the Show Committee of the National Machine Tool Builders' Association. The machine, a mechanical press, weighs more than 108 tons.

The absence of overhead cranes, usually present in an industrial plant, has been offset in the International Amphitheatre by the use of locomotive cranes and A frames to handle the heaviest pieces of machinery. Even with a ceiling clearance of 73 ft in the arena, the locomotive cranes tower between the roof girders, limiting the effective swing of their booms. This is where A frames have come to the rescue to move some machines into place.

But to use either locomotive cranes or A frames has required considerable planning. This was started months ago by giving each exhibitor a target date when he was to start his shipment of machines to Chicago. This date was picked so that the machines which, once they have arrived at the Amphitheatre, have the longest distance to travel from railroad siding or truck unloading dock to their assigned space in the exhibit halls, will be the first to be set up.

Believed to be the first time such detailed planning has been employed in a show of this kind, the program, in effect, enables locomotive cranes and A frames to be used with a minimum of interference with each other or with other materials handling

equipment present. Ample room for necessary maneuvering is allowed by this arrangement which also facilitates an orderly, step-by-step withdrawal of the handling equipment as each machine tool is moved into place. Altogether it is estimated that at least 300 railroad cars and 1000 trucks will be required to bring the exhibitors' machine tools to the show.

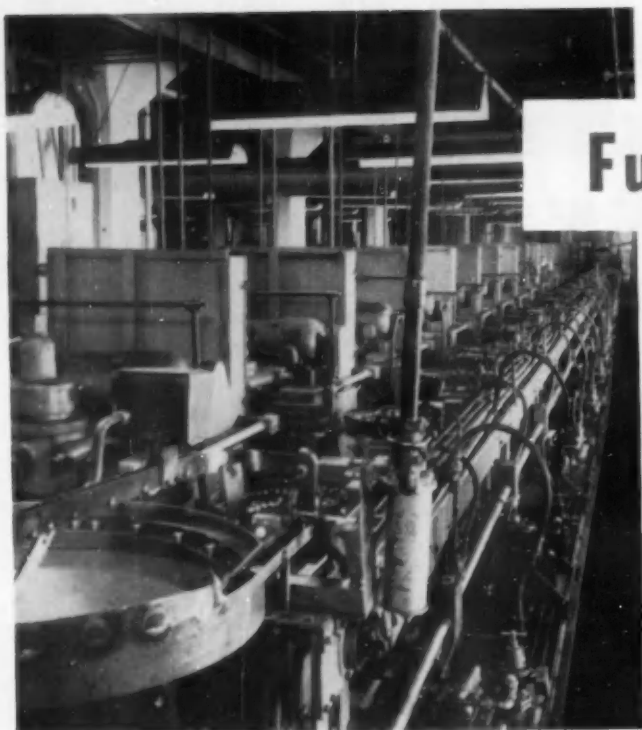
Because of the great size of some of the machines to be displayed at the show it has been necessary in some instances to prepare large concrete-lined pits into which they could be lowered sufficiently to bring their immediate work areas to levels at which passers-by could view them readily. In other cases, where such special foundations would involve too extensive preparations, it has been arranged to erect the machines directly on the floor but to surround them with elevated platforms from which spectators can get a "close-up" look at the equipment in operation from any one of several vantage points.

Exhibits which are to be treated in one or the other of these ways include enormous broaching machines, shears, brakes and presses.

One of the biggest problems of the Show Committee has been to find sufficient space for the storage of the raw materials which will accompany the machines to the show. These are to be turned, milled, planed, drilled, ground or formed, as the individual machine tools are kept in almost continuous demonstration throughout the ten days of the show. The problem,

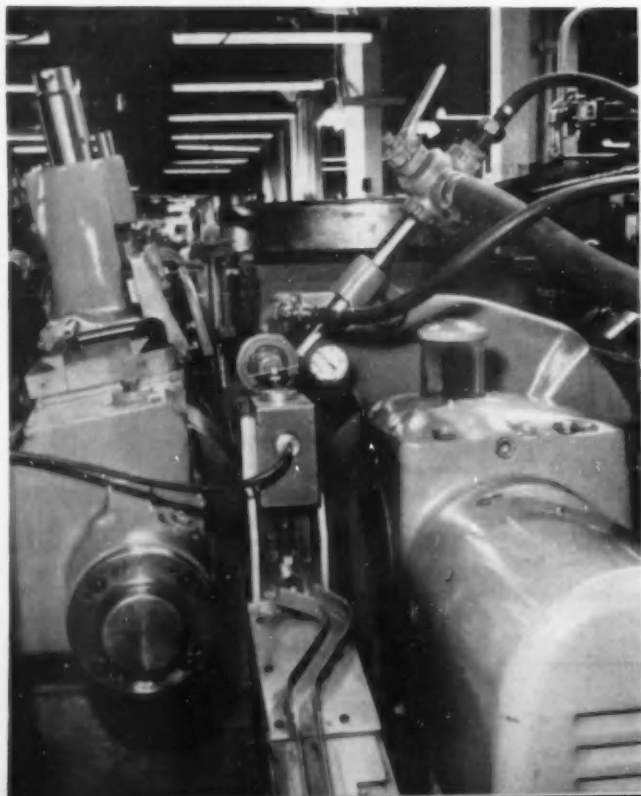
*(Turn to page 118, please)*





Perspective view of the long row of 15 Fellows gear shapers on the automatic gear process line. The feeder conveyor is at the extreme left, as shown.

Here is the Cincinnati centerless grinder work station. Rough gear blanks may be seen feeding to the work station from the rear, emerging in the foreground. The air gage is directly ahead of the ejection chute in the center foreground.



## BUICK'S Fully Automatic

**I**MAGINATION, vision, advance planning—call it what you will—the basic ingredient in automotive progress has been responsible for the development of one of the most unique automatic gear process lines to be found in the industry. We refer specifically to the completely automatic line now in operation at Buick in Flint for producing small planet pinions for Dynaflo drives. Featuring about 40 special machines of various types, the line was visualized and built under the supervision of Frank W. Albro, assistant master mechanic in the Buick transmission department. The current setup is capable of producing 3 million of these small gears during a model year.

According to E. T. Ragsdale, general manufacturing manager, the advance planning on this project began almost three years ago and was developed from scratch during the past two and a half years. Looking behind the scenes, it may be noted that the need for a completely automatic gear line was anticipated just as soon as the master mechanic's department learned that the small gear would be required in large quantities for 1955 Dynaflo production.

Certain aspects of the problem made it imperative to seek automatic processing. For one thing, these gears are smaller in size and have finer pitches than transmission gears employed up to now. Since the parts are so much smaller they are more difficult to handle manually, loading time representing too high a percentage of floor-to-floor time. Moreover, it was recognized that fully automatic cycle equipment, capable of continuous operation without operator attention, was a must in keeping with present-day manufacturing procedures.

Although the objectives were clearly defined, their translation into a production line was beset with almost insuperable barriers. In the first place, there was no production equipment—in the gear making category—that was entirely suitable for such small transmission gears. Hence it was necessary to start

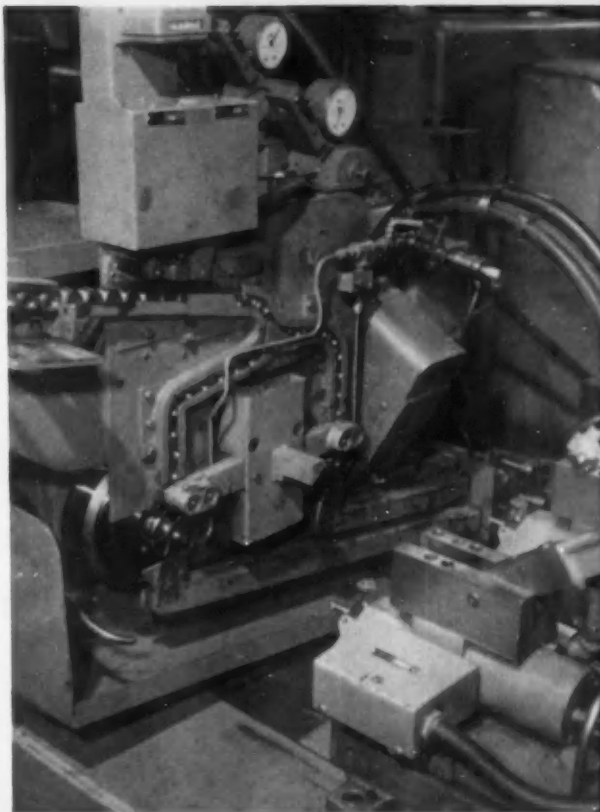
# Gear Processing

By  
Joseph Geschelin

with whatever was available. With the exception of several types of machines which had been fitted with magazine feed in the past, none of the equipment had been previously operated with automatic loading and unloading.

Thus one of the major problems was the development of automatic loading and unloading; provision of some reliable gaging and control devices for automatic sizing, sorting, and adjustment for tool and wheel wear. When a major line of such character is to be operated continuously and without operator attention, it is also necessary to provide for automatic sensing devices to shut the machine down in case of trouble, to achieve accurate size control within extremely fine limits, and to constantly police machine condition and tool adjustment for evidence of lack of control for any cause.

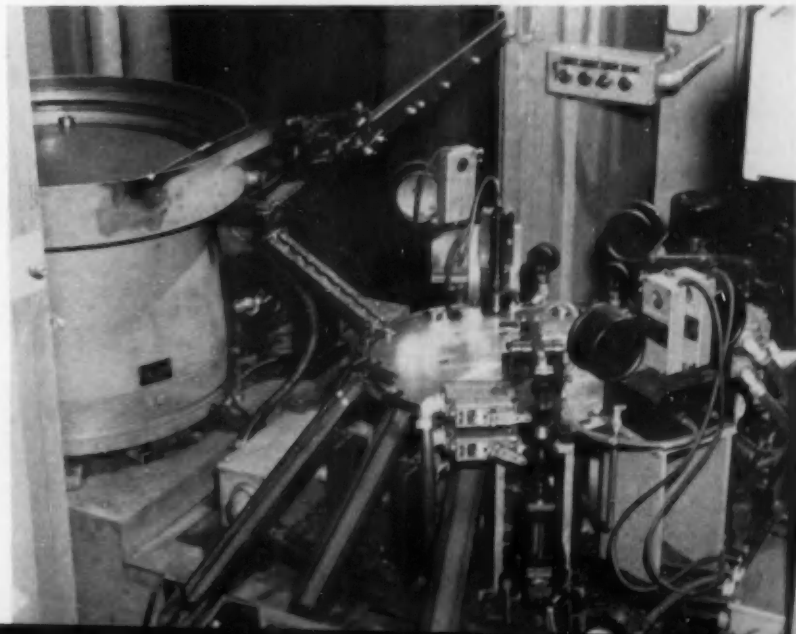
Finally, continuous operation made it imperative to provide for the mechanism that would feed parts to each machine, in the proper quantities, and as required, again subject to positive controls for counting as well as for shutting off flow when necessary. It will be noted as details of this line are described that despite the wide variations in the production rates of different items of equipment, the special storage racks and stand-by Syntrol mechanism—supplemented with positive counting devices of photocell or microswitch type, as the case may be, have solved the formidable

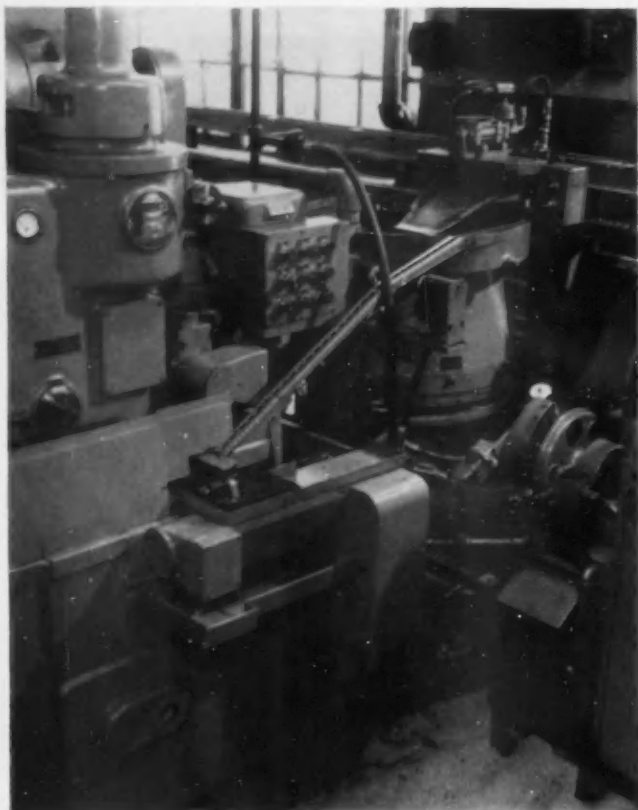


**Above right—**

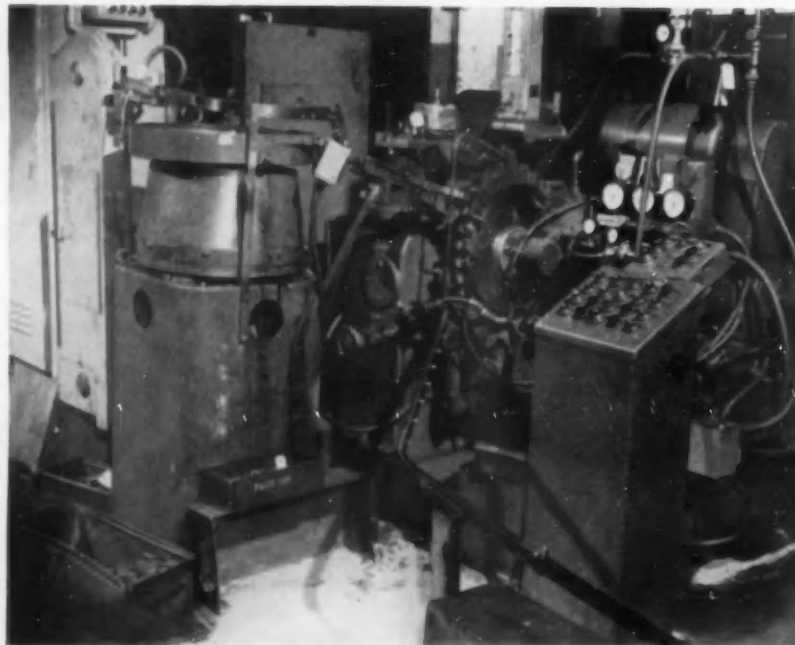
Looking at the work station of one of the Heald Sore-Matics. Gear blanks feed automatically from the left, divide to feed each of the two work stations. The finished pieces drop into the chutes below the chuck, pass through the automatic gaging station at the extreme right in the center.

Close-up of Sheffield gaging arrangement on the Healds, with the sorting chutes prominent in the foreground.





*Feeding arrangement for a Fellows gear shaper. Parts flow from the conveyor in the background, through the Syntro and down the chute directly to the loading station in the center. Finished parts come out on a chute below the level of the work table, move through the inspection gage at the extreme right in the foreground. Acceptable work then unloads onto a lower level of the conveyor to the next operation.*



*Here is the Gardner surface grinder for finish-grinding the two faces of the pinion. Gears are fed from the Lamb storage conveyor at the extreme left, by-passing the standby Syntro unit being delivered one-by-one to the indexing fixture.*

set of problems quite acceptably.

Consider now a brief summary of the sequence of events on this line. The line is compact and self-contained and developed in two parallel rows of equipment. The first row takes the gears through all "green" operations. At the end of the row there is the only break in the completely continuous cycle since it is necessary to remove the loads of gears and transport them to the heat treating department. Following this, the work proceeds through the "hard" line to final acceptance.

The operation begins with automatic gaging and sorting of blanks from the automatic screw machine department. Acceptable blanks then are transported by an elevator and loaded into the first Syntro unit feeding the Cincinnati centerless grinder. This is the start of the automatic cycle since the centerless-ground OD prepares the work for succeeding operations.

Blanks issuing from the Cincinnati go to a distributor which serves the function of apportioning the flow of blanks to each of three storage conveyors. These, in turn, are arranged to feed a battery of two Heald No. 221 Bore-Matics of single-end, two-spindle type—

one for semi-finish boring, the other for finish-boring. The first Heald faces one side, then semi-finish bores. The work then moves to the second Heald where it is chucked on the faced side to permit facing of the opposite side as well as finish-boring to a total tolerance of 0.0005 in.

Let us digress a moment to touch on the automatic control of the equipment. In the case of the centerless grinders, automatic gaging is

employed to check the OD and is instrumental in triggering the mechanism in the machine for adjusting the wheel. In addition, the machine has an automatically-cycling wheel dressing mechanism.

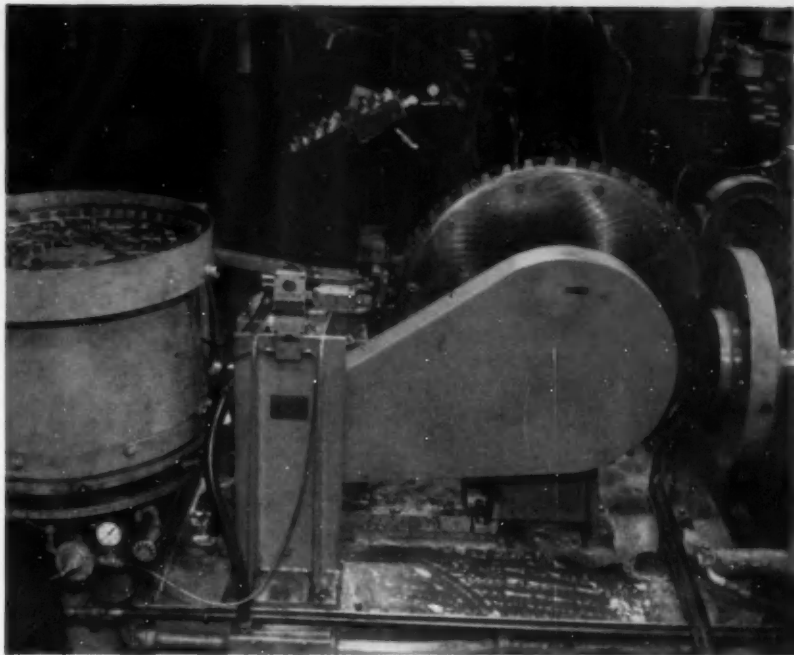
On the Heald machines, an automatic Sheffield air gage device supplies the sizing and sorting means while scanning the blanks as they emerge from the work station. Oversized and undersized blanks are dropped through trap doors for salvage later while acceptable parts continue on to the next operation. At the same time, the gage senses variations from standard, triggers the mechanism for adjusting the tools and shuts down the machine if more than three consecutive parts gage outside limits. If the bore is too small to permit entry of the air gage, the machine is automatically shut down.

Eight of the 40 machines in the line have gages that function in this manner, providing for automatic tool setting. Thirty of the remaining machines are fitted with gages that size and sort but do not affect machine adjustment. However, in all instances, the gage will function to shut down the machine if three successive parts are off size.

As parts come out of the Heald machines, the accepted pieces are transported to a storage box, thence to a distributor for feeding a long row of 15 Fellows No. 4GS gear shapers. At this point is found one of the special counting arrangements. The distributor is set to count 150 pieces and release them at given intervals. The conveyor transports them along the machine line, feeding 10 pieces to each machine. If a machine is down for any reason, the line supervisor presses a suitable button on the control panel to reduce the count by 10 pieces or multiples of 10 as the case may be. Counting in this case is by means of a photocell.

Similar distribution systems have been devised for each of the other types of machines. The important thing is that the line continues in operation without being affected by the stoppage of any of the equipment.

Within the Fellows gear shapers, the blank is automatically loaded and clamped in position on the arbor, gear teeth cut and top of teeth chamfered, removed from the arbor, and ejected into the out-



*This view shows the special oil groove grinder developed by Sheffield for this operation. Gears feed to the indexing fixture from the Syntron at the left.*

going chute that leads to the automatic gaging and sorting equipment.

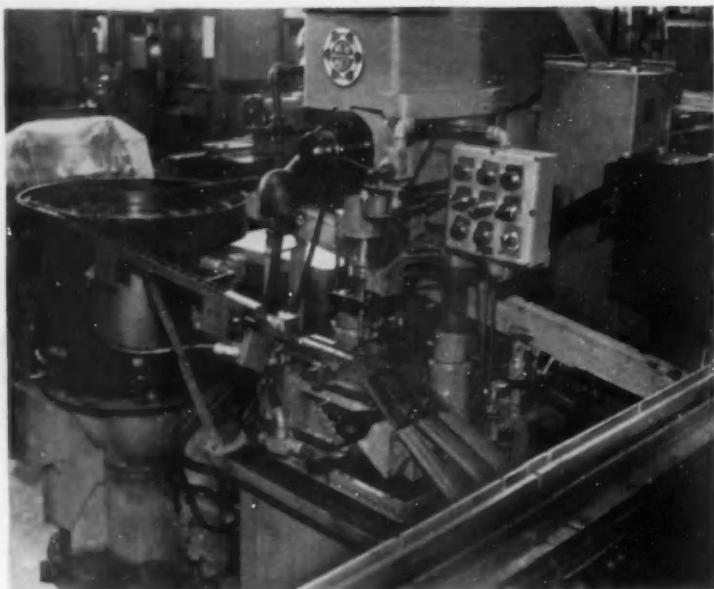
As the gear enters the chute, it interrupts a photocell light beam before reaching the automatic gaging and sorting mechanism. This initiates rotation of the cradle into which the gear is nested. The gear meshes with an internal gear sector, being forced to move a complete revolution by the cradle. If, for any reason, the root diameter is shallow, the cradle stops. As the cradle continues rotating, the work rolls between a segment of a second internal gear sector and a master gear. The gear is pinched between the internal gear sector and the master gear which is mounted on a lever to permit sorting—oversize, undersize, and acceptable. The latter rolls out of the cradle down the chute to the deburrer; the rejects drop into suitable containers for inspection and salvage.

Following gear cutting, the work goes to a storage conveyor, thence is counted out to the conveyor feeding a group of six gear shavers—two each of the following makes: Fellows; Michigan Tool; and National Broach. Automatic gaging is handled by different means in each of these machines.

After shaving, the gears are collected in stock trays, go through a batch washer and are transported to heat treat.

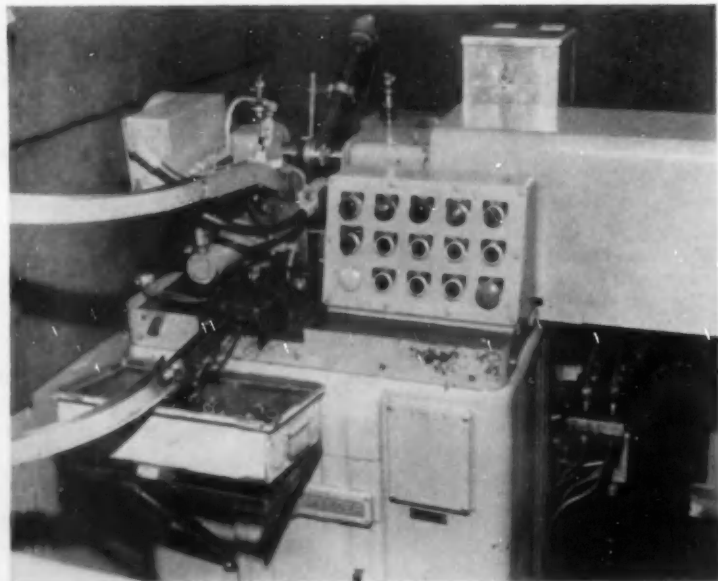
When the gears return they are fed to a stock elevator—as at the start of the operation—then to a Syntron unit for feeding into a special Sheffield gear tooth chamfering machine. Then the gears enter another storage conveyor from which they are fed automatically into the indexing fixture of the two-

*(Turn to page 56, please)*



*Finish-honing of pinions in one of the six Micromatic honing machines. Work is delivered on the conveyor in the foreground, directed to the Syntron at the left, and fed to the work station in the center. Honed bores are gaged as they leave the honing station, they are sorted into the chutes in the foreground, the acceptable parts returning to another level on the conveyor.*

*Inside the inspection booth where final inspection is performed automatically in the battery of six gear speeders. Shown here is the Red Ring speeder equipped with the electronic ear which may be seen in the background at the left. Work enters the booth on the upper chute, leaves by the lower chute. Rejects drop through a trap into the bin under the lower chute.*



wheel, No. 115-18-in. Gardner disk grinder. Here is another of the special machines evolved for this critical operation. The grinder is required to hold total thickness to 0.002 in. with faces flat, parallel and square with the bore. It has an ingenious arrangement for clamping the work in such fashion as to permit each wheel to gage its position from the center line of the gear face. It also has an automatic mechanism for correcting wheel spindle position on both sides to maintain size control.

Gears now enter another storage conveyor from which they are fed to a special Sheffield machine for cutting an oil groove in the ground face. Then they are transported to the next storage conveyor, thence to a distributor feeding the conveyor traversing a battery of six, single-spindle Micromatic Microhone machines. Here, too, the work is fed into each machine automatically, in timed sequence, and automatically positioned and fixtured. In addition to the Microsize control inherent in these machines, the honed bores—held to 0.0005 in.—also are inspected by means of two Airlectric gage heads. These handle sizing as well as segregation, rejecting parts into bins for later salvage.

Microhones also provide for other contingencies. For example, if a loading chute fails to fill, the machine as well as the loader are stopped. If three consecutive parts are rejected, the machine shuts down. If the abrasives are worn out the machine will stop.

Acceptable parts then are washed, moved through an orienter, and delivered to a storage conveyor serving a battery of six automatic gear speeders. Two of these are Red Ring; the other four are Michigan Tool.

An interesting feature of this final step is the current experimental work with an acoustic pick-up device for detecting ob-

*(Turn to page 128, please)*

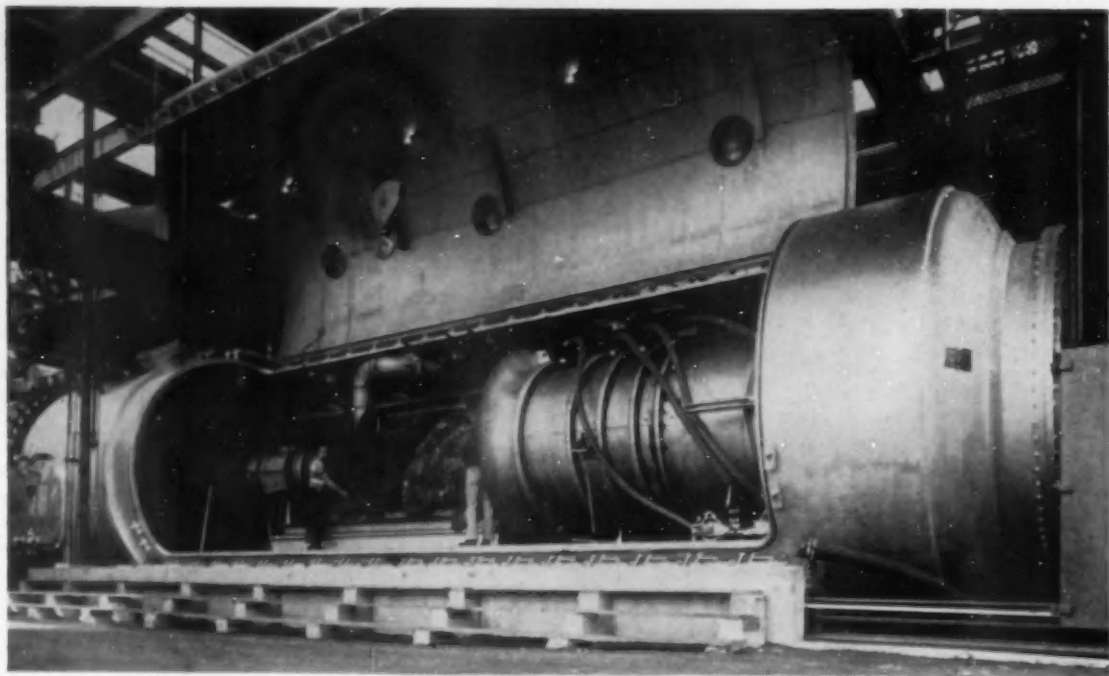
## DEATH ..of a Car..

**T**HE "Film Strip" at left shows a junked automobile being consigned to the scrap metal heap by a Michigan Model 125A tractor shovel manufactured by the Clark Equipment Company's Construction Machinery Division at Benton Harbor, Mich. This big model in the Michigan line has a two and one-quarter cubic yard bucket capacity, can lift 15,000 lb and travels as fast as 27 mph. It features a Clark-built power shift transmission which multiplies engine torque 300 per cent and eliminates conventional gear shifting.

*In the scrapping area, the tractor operator pounds his vehicle's bucket against the roof of the target at the graveyard. The car's been stripped of engine and other units.*

*Body of the car is now thoroughly flattened and ready for removal as scrap.*

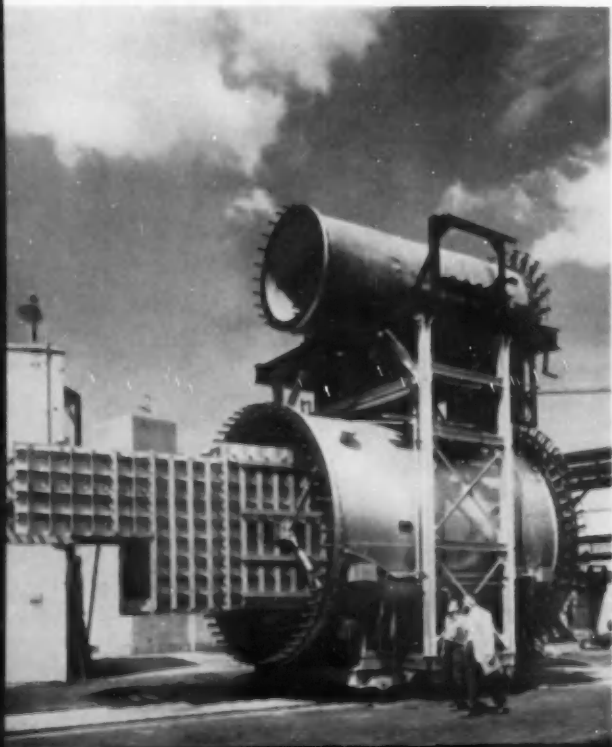
*The tractor shovel completes the job by rolling up to a truck and depositing the scrapped car atop another. The junked vehicles are trucked off and sold as scrap iron and steel.*



The new test stand for ramjet engines is 98 ft. 10 in. long and has a side hatch 36 ft in length. Hatch in the illustration is open, and a tarpaulin has been thrown over installation to maintain security.

## Huge Supersonic High-Altitude

Here is a side view of the free jet unit.

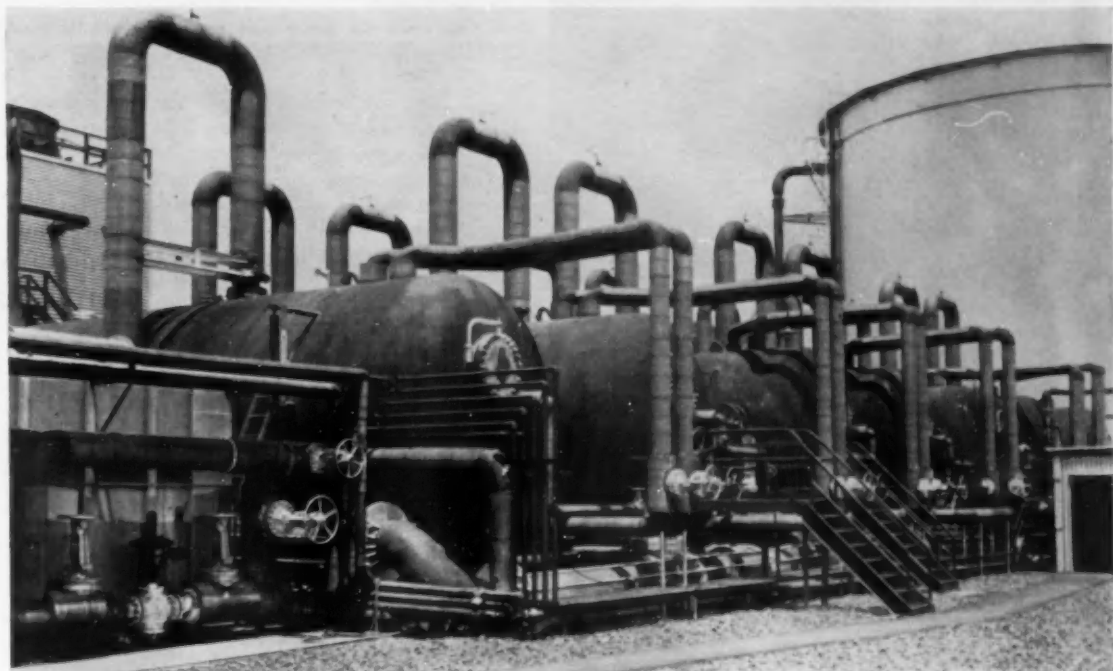


THE largest privately operated supersonic, high-altitude laboratory in the United States for the development and testing of ramjet engines has recently been put in operation by the Wright Aeronautical Division of the Curtiss-Wright Corp.

A series of nine steam ejectors have been installed that will reduce pressure inside the test chamber by evacuation to achieve the simulation of high altitude. Four of these ejectors are of 24-in. diameter size and require 75,000 lb of steam per hr each to operate. Two others are of 42-in. diameter size, requiring steam at the rate of 300,000 lb per hr each. These are intended for blow-down runs.

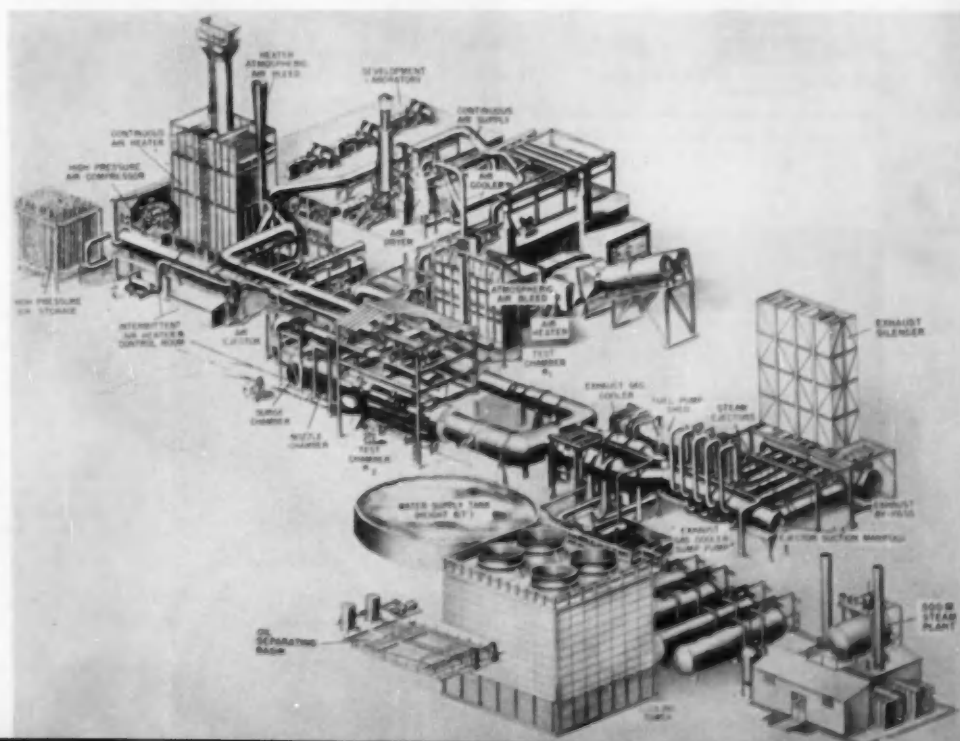
The other three measure 48 in. in diameter, the largest steam ejectors ever fabricated. They each require steam at the rate of 400,000 lb per hr and are, similarly, intended principally for blow-down use. One more ejector can be added later if a requirement for it develops.

In order to silence noise and keep the intense combustion temperatures from reaching the outside of the tank, the test chamber is water-jacketed over its entire length, and the water flows between two steel shells one inch thick. The side hatch also contains water

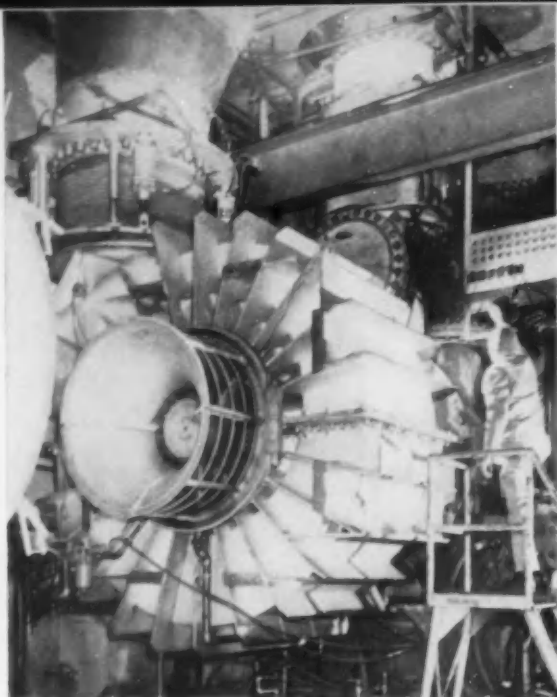


Closeup of seven of the steam accumulators. Tank in right background holds cooling water for hot exhaust gases. New steam generating capacity has been added to the plant's original boilers.

## Laboratory for Ramjet Testing



**Arrangement of units  
in the ramjet test  
facility.**

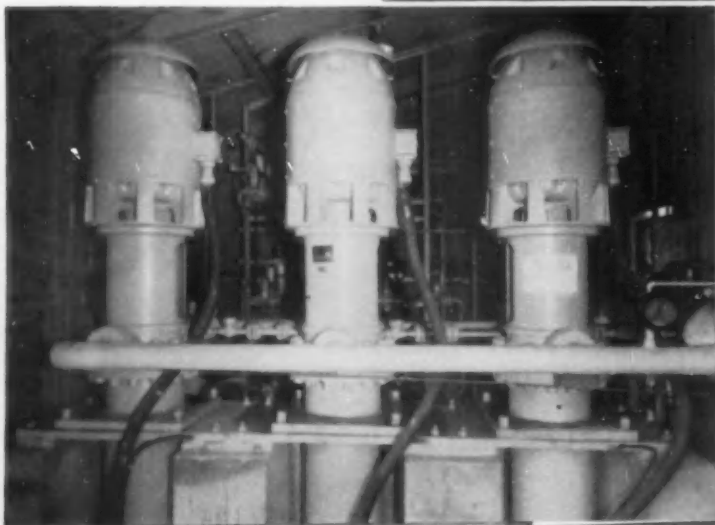
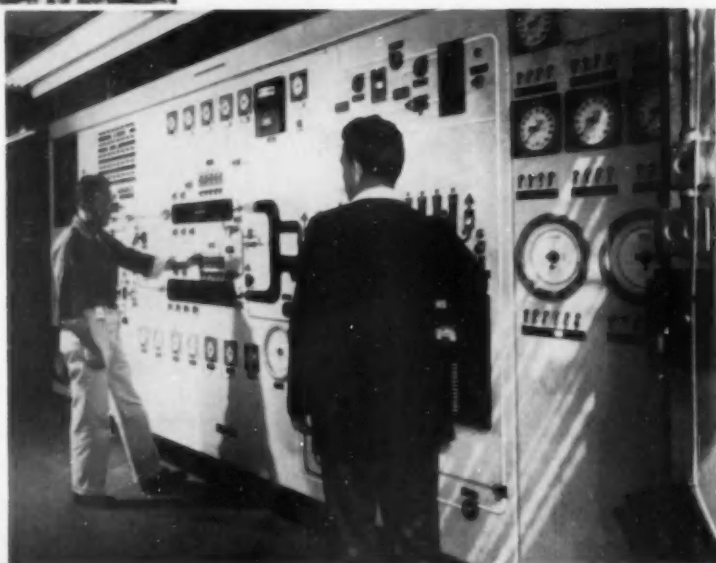


between its inner and outer shells. Flexible hoses connect this water to the tank's outer cooling system.

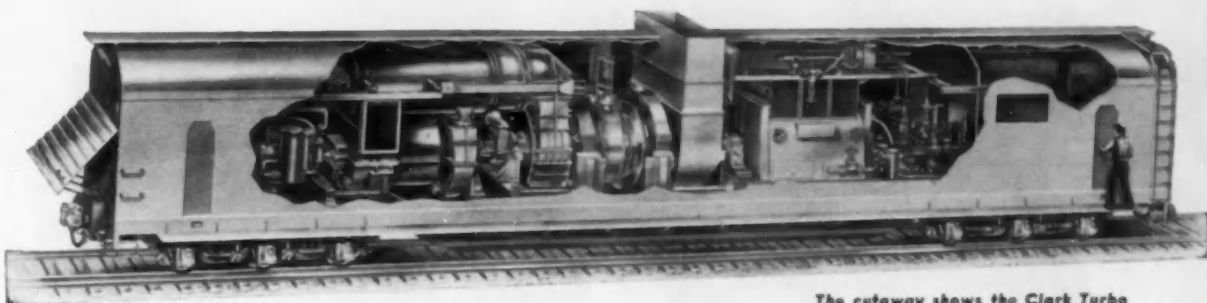
The performance figures on the company's power plants are classified information, but it is generally understood that ramjets are best suited to speeds of from Mach 2 to Mach 5, or from 1500 to more than 3500 mph at sea level. The new laboratory, which cost \$7,700,000, was designed by Curtiss-Wright engineers and was built under sponsorship of the U. S. Air Force. Shown here are some selected views of the new facility.

*Huge compressor, at left which supplies air for operation of ramjet engines, is driven by three synchronous electric motors having a total output of 17,000 hp.*

*Flow of steam, water, air, etc., are controlled at this board. Major elements of the laboratory are diagrammed on the panel.*



*Three large pumps draw fuel for the ramjet laboratory from underground tanks and deliver it to engines or components on test. Maximum capacity is 15,000 gph.*



## Emergency Power Station on Wheels

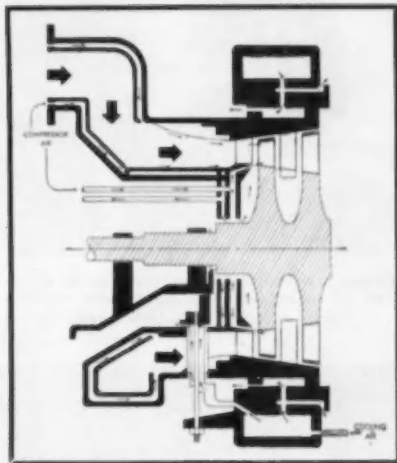
The cutaway shows the Clark Turbo mobile power plant mounted in an 85-ft railway car built with side truss frames. The opening on the end of the car is for air for the lube oil coolers. The opening through the roof in the center of the car is the exhaust from the turbine. At the left is the Diesel starting engine with torque converter and clutch, followed by the turbine, generator, exciter, and fuel pumps and the control room. The unit requires connection to fuel and transmission lines only.

Details of the mobile power plant which won a Navy design competition have been released by Clark Bros. Co. of Olean, N. Y., one of the Dresser Industries. It is a 5500 kw unit powered by an open cycle dual shaft gas turbine, complete in one railroad car. One man can operate the unit and put it into service on a very short time.

The gas turbine has a 13-stage compressor connected by a flexible coupling to a two-stage turbine. A second two-stage turbine on a separate shaft drives the generator. Compressor pressure ratio is 4.25 to 1 and flow is 100 lb/sec at 5000 rpm. The rotor is a two-piece forged drum with T grooves. Blades are inserted in a single slot with a locking insert. Stator blades, mounted in quarter circular rings, are easily removed.

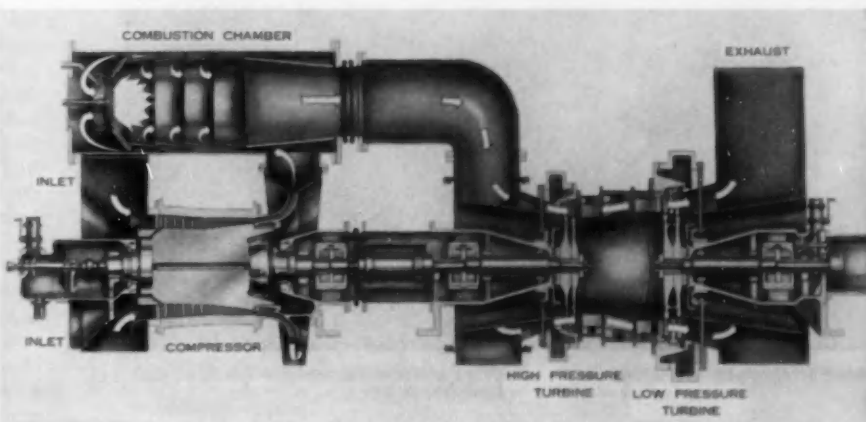
The turbines have forged and shrouded blades. Stator blades are cast and attached to carrier rings. Normal inlet temperature is 1350 F, with derated-output temperature 1150 F for 3200 kw output. A flexible duct connects the two turbines, and is easily removed to expose them both.

All radial bearings are babbit- (Turn to page 112, please)



Detail of the air cooling system at the compressor turbine.

Simplified cross section shows the flow of air and gas. Air enters the axial compressor at the lower left, discharges into the combustion chamber at the upper left where it is mixed with either liquid or gaseous fuel and burned. Hot gases enter the high pressure turbine, center, then the low pressure turbine, right, which is connected to the load. Compressor and first turbine are on one sub-base which is attached on the car with a three point mounting. Second turbine and generator are on a similar sub-base.



# IMPORTANT STEPS

*in Making*

## *Hollow Crankshafts*

COLOGNE, GERMANY

SEVERAL advantages are claimed for the hollow cast nodular iron crankshaft used in the new Taunus 15M built by the Ford plant in Germany. There is a substantial saving of weight with the same rigidity. In addition, after the design was finalized and production started, it was found that machining was easier and total cost lower than for a solid crankshaft for the same engine.

Output of the 15M is now about 270 cars per two-shift day at the Cologne plant. The engine is a four-cylinder ohv unit of abnormally oversquare design, with bore and stroke of 3.228 in. and 2.791 in. Piston displacement is 91.41 cu in. and rating 60 hp at 4500 rpm.

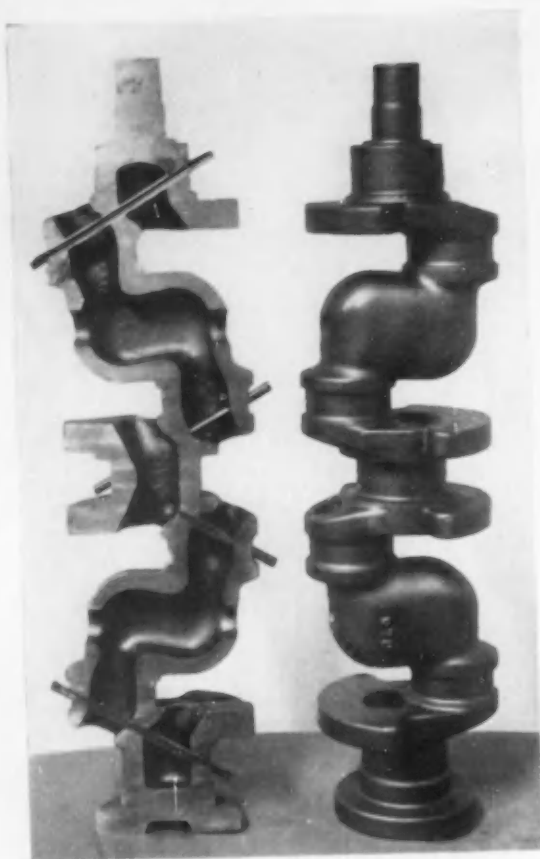
This model was introduced in January. The idea of incorporating a hollow crankshaft dates back to September 1953, when the chief engineer at Cologne, Alfons Streit, was visiting Dearborn, Mich., where

help from foundry engineers at the parent Ford organization in America was enlisted. Development work was started in Germany five months later.

The crankshaft has hollow main bearings, crank pins and cheeks. Six individual cores form the internal voids. Oil channels are steel tubes with which the shell is integrated during casting.

Evolution of the final form began with a solid steel crankshaft for comparative purposes. This was followed by hollow steel and then nodular iron castings. Variations of the latter included several semi-hollow designs with solid crank pins or main bearings.

Experiments were also conducted with internally-cast pillars, connecting the three main bearings

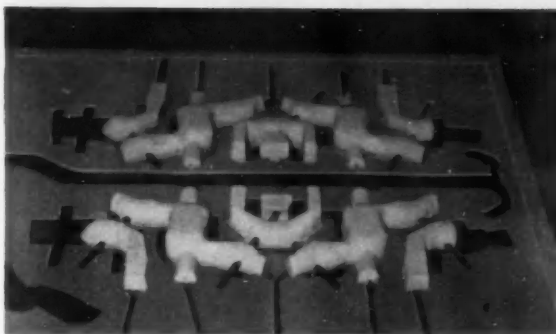


Hollow crankshaft casting used in the Ford Taunus 15M. Steel oil tubes are integral with the nodular iron casting. The two center tubes are angularly displaced.

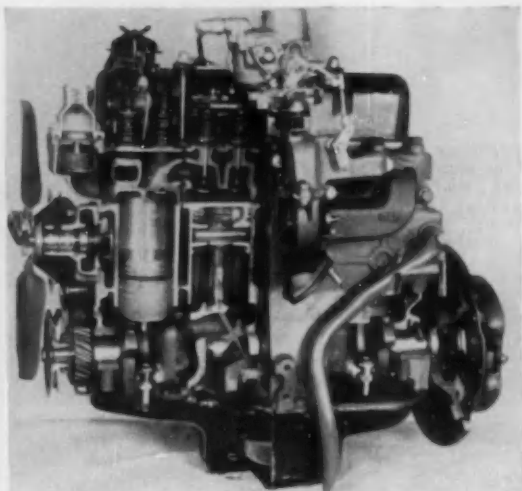


The four crankpins are milled simultaneously on a Heller four-spindle machine. Cutting speed on the nodular iron is 230 fpm.

**By David Scott**



**Drags with cores supported by oil tubes are lined up on the foundry floor. Core plugs for the flywheel end (left) are made of oil sand and inserted separately.**



**Cut-away view of the Teunus 15M engine. It is of over-square design with 91.41 cu in. displacement, and develops 60 hp at 4500 rpm.**

with adjacent crank pins, to provide for subsequent drilling of oil channels. These seemed advisable at first, but were dropped in view of the additional supported cores required, and because the initial difficulties with steel tubes were overcome. Other teething troubles such as core strength, porosity in the iron, and internal cleaning of the rough casting were likewise disposed of.

Successive improvements resulted in a hollow crankshaft weighing only 25.3 lb against 34.3 lb for the conventional type—a weight saving of 27 percent. The total rotating weight was reduced by 13 percent, and at 400 rpm its centrifugal force was halved, the extent of balance as a proportion of rotating weight nearly tripled, and the peak load on the main center bearing cut from 2462 lb to 1844 lb.

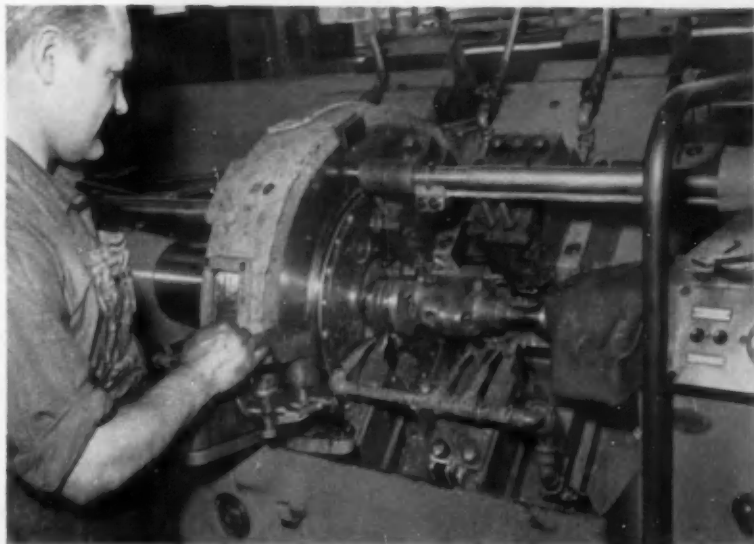
Production cost is figured to be 6 percent less. The considerable saving of metal is said to compensate for the additional core work and higher price of nodular iron. Beyond this, three minutes less machining time per unit is required as there are no oil holes to be drilled, and because this iron permits higher speeds and feeds.

Castings of the crankshafts are purchased from three outside suppliers:

Monforts, Schmiedag, and Karl Schmidt. Largest of these is Eisengiesserei Monforts, Mönchengladbach (25 miles north of Cologne), which makes 130 castings daily.

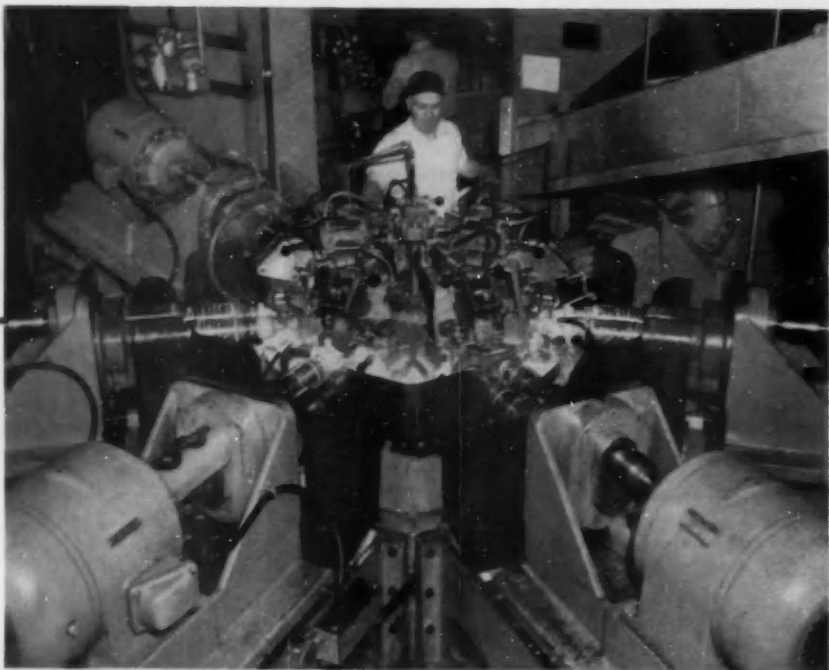
Two complete sets of cores are prepared simultaneously in the permanent core mold. Support wires for the two larger core sections are first laid in place, together with the four oil tubes. The latter

*(Turn to page 110, please)*



**A Boehringer multi-tool lathe rough turns the main bearing journals, counterweights and pulley-end profile.**

Perspective view of one of the horizontal type six-head Hartford Special machines set up for machining the cavity in socket forgings.



Close-up of work station of the Colonial vertical broaching machine for finish broaching the oval-shaped throat in the socket. As illustrated, three pieces are finished at a time.



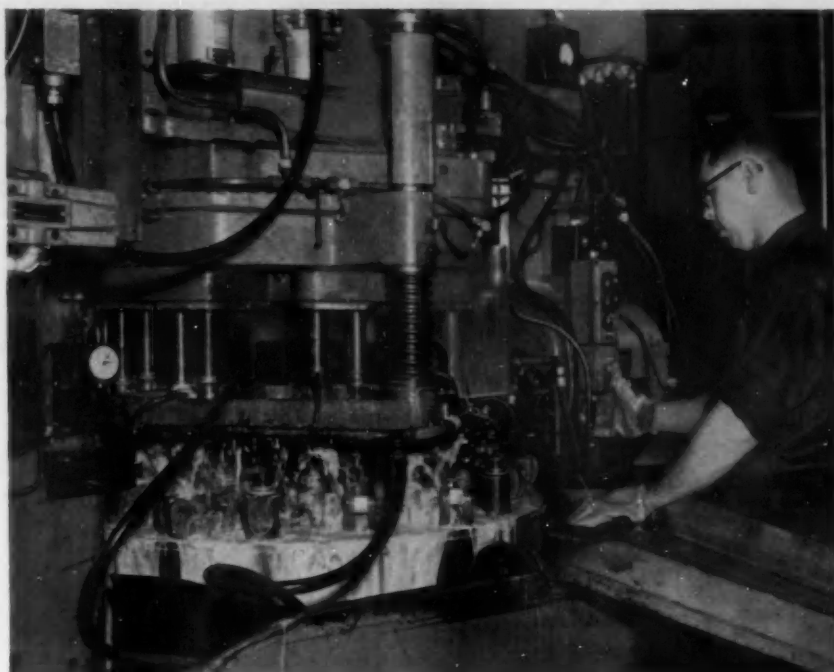
## Single Purpose Plant for FRONT SUSPENSION BALL JOINTS

**T**HOMPSON Products has an interesting single purpose plant located in the farming community of Fruitport, Mich. Here the company produces ball joint assemblies for passenger car front suspension systems, employing the most advanced mass production techniques suitable for these components. Single-purpose, automatic cycle machines of latest types are found in the machine shops, including a large battery of Hartford Special machines, a unique Rehnberg-Jacobson machine, a vertical Colonial broach, and a battery of National Acme Gridley automatic screw machines.

A large press shop equipped with a variety of Bliss presses handles the fabrication of a number of precision stampings, using progressive dies on first operation setups.

The plant is served by a large installation of Holcroft furnaces for heat treating stampings and studs.

In view of the current interest in automation, it is noteworthy that extensive mechanization has been employed to eliminate practically all manual handling. This has been accomplished through the installation of a system of Rapistan elevators and belt conveyors throughout, for feeding to the various items of equip-



One of the vertical type Hartford Special six-head machines for handling the drilling operations on socket forgings.

Close-up of one of the National Acme Gridley automatics to show the method of automatic feeding of studs to the work station. The feeder is loaded manually as shown.

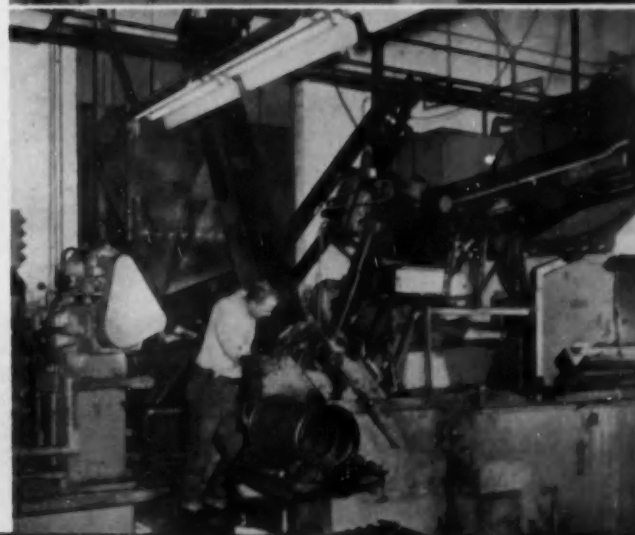
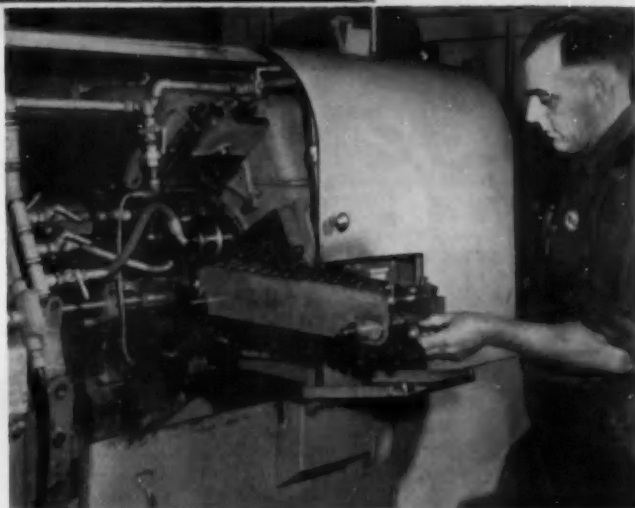
ment, and for transportation from one operation to another. The installation is neither dramatic nor expensive but it does the job unobtrusively and capably.

Ball joint assemblies come in upper and lower assemblies, interchangeable for right and left hand sides of the car, and consist of a fairly large number of component parts as illustrated. Major parts include: the socket—a drop forging; a carburized stud; a pressed steel insert; and a heat treated spherical bearing.

Although the major parts for upper and lower assemblies differ in detail, they are quite similar in machine shop operational sequence. Accordingly, T-P has parallel rows of similar machines for each type.

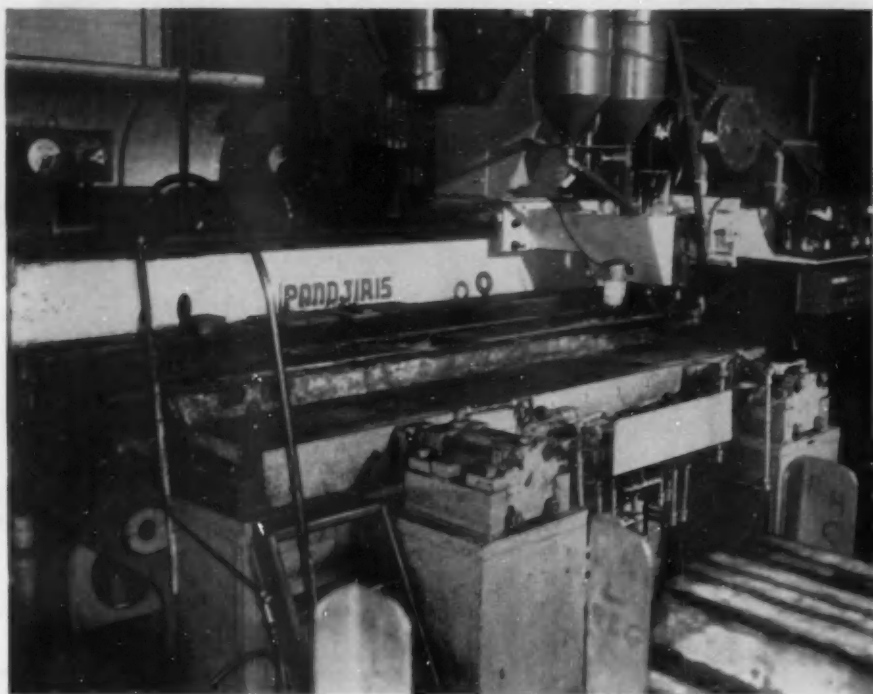
Consider the lower socket as a typical example. The cavity of the socket, including the spherical section, is machined in one setting in a large six-head Hartford Special machine with automatic

*(Turn to page 125, please)*



All material handling is done by means of Rapistan elevators and conveyors of various kinds. This is one of the junction points, showing a network of conveyors for transporting parts from one department to another without manual effort.

FIG. 1—This machine welds track frames for International Harvester. It mounts two Lincolnweld automatic heads for making two parallel welds simultaneously. Carriage for heads in background. Bed and clamping controls in foreground.



**T**HE Tractor Works of International Harvester Co., Chicago, has used hand arc welding on track frames for many years. Now, however, major welds on such components are being made by new automatic or semi-automatic welders that are not only much faster but produce uniformly superior welds. This equipment is now installed in a new weldery and has resulted in many cost savings.

Track frames are heavy and highly stressed assemblies and are built up largely from shapes and plates to provide structures that, though rigid, are lighter and stronger than steel castings would be. Many of the longer welds are made two or four at a time with the components clamped hydraulically and pneumatically.

One of the new automatic welding machines is shown in Fig. 1. This unit is made by Pandjiris of St. Louis and mounts two of The Lincoln Electric Company's standard Lincolnweld heads. This machine welds track frames which are made of two steel channels spaced apart by heavy plates having straight parallel beveled edges next to the channels. Welds are made in the groove between the spacers and channels. Both heads are carried on a common carriage that also supports a common hopper for No. 840 mild steel flux, serving both heads. The carriage also mounts control panels, wire reels, a supplementary flux hopper and a vacuum pickup system, whose suction nozzles trail the wire jaws by a few inches, and wires from two 900 ampere Lincoln generators.

## Automatic Arc Welding

The bed of the machine contains the holding fixture whose clamping elements are operated by rams in cylinders shown in the foreground of Fig. 2. Clamping portions are adjustable longitudinally and different spacers are used to fit track frames of different sizes.

Box section assemblies are among other weldments made with automatic welding machines. Each box section includes two narrow but heavy plates whose edges are notched at 90 deg to receive wider but somewhat thinner side plates. It requires four continuous arc welds that run almost the full length of the weldment to join these components. As each box section requires four parallel welds, evident economies are attainable if all four can be made at one time in a fully automatic machine. The machine shown in Fig. 3 was developed by Pandjiris to do the job and is now in active use. To make all four welds simultaneously, the setup is designed for making these welds in the so-called "three o'clock" position.

The parts are clamped both vertically and horizontally transverse to the length by pneumatic and mechanical clamps. Loading of the heavy parts and subsequent unloading of the weldment are facilitated by using the bale, Fig. 3, movable transversely on track

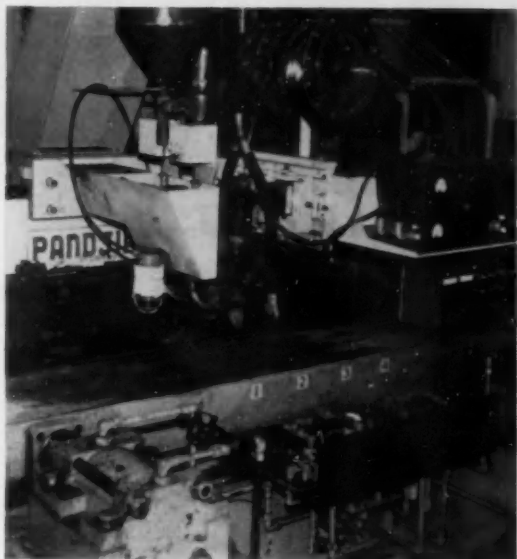
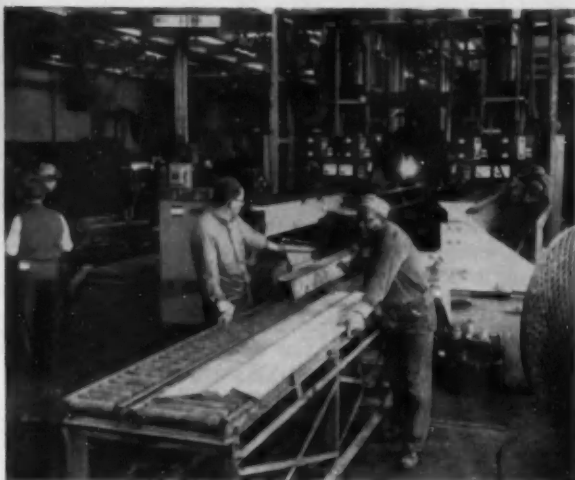


FIG. 2—Another view of the machine in Figure 1, showing the carriage supporting two Lincolnweld heads, reels for electrode wire, controls units, vacuum pickups for flux and cables from the generator in left background.

FIG. 3—Removing a welded box section after completion of four simultaneous three o'clock welds in the four-head machine in the background. Plates on the table in the foreground are ready to be loaded into the machine for production of the next weldment.



**By D. L. Hanson**

Mechanical Engineer, Tractor Works  
International Harvester Co., Chicago

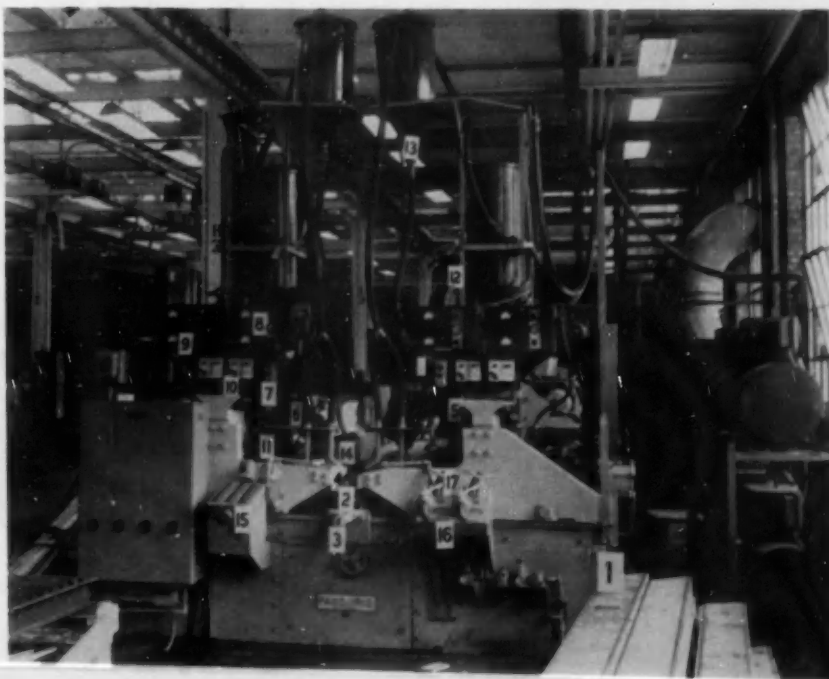
## of Tractor Components

wheels and having two sections of roller conveyor on top.

In Fig. 4, many components of the machine can be seen and at right are the four 600 ampere d-c generators that supply current to the four welding heads.

Operation is as follows: a rolled bottom plate is pushed into the machine, two side plates are placed on edge in the rolled corner recesses and then a top plate is added, (Page 126, please)

FIG. 4—Four-head Pandjiris machine (below) makes four simultaneous three o'clock hidden arc welds the full length of a box section clamped in welding position. Components designated by numerals include: 2—lower support for the weldment; 3—hand wheel for vertical adjustments; 4—left and right clamping members; 5 and 10—carriages that support the four welding heads; 6—one of the heads; 7, 8, 9 and 15—control units; 12—one of the four reels that supply  $\frac{1}{8}$  inch, L-60 mild steel wire to the heads; and 13—the elevated hopper that supplies flux to head hoppers. Also shown are parts of the pneumatic locking system and of the vacuum system that picks up unused flux used to submerge the arcs.



# Free-Piston Diesel Compressor

## Has Separate Air-Cooled Cylinders

A FREE-PISTON Diesel-compressor of unusual design has been introduced by Freiflug Kompressorenbau GmbH, Düsseldorf, Germany. While intended primarily as an air compressor for construction and industrial purposes, this unit is stated to be well adapted for use as a compressor for gas turbines.

Separate aircooled cylinders are used for the compressor and the two-stroke Diesel, both of these being of opposed piston design. This layout reduces heat transfer from the engine to the compressor, and the resultant compactness facilitates the forced-air cooling. Adjacent pairs of pistons in the parallel barrels are linked by connecting rods and rocker arms. The synchronizing link between the two is carried diagonally on eccentrics at the pivot bearing of each rocker arm.

Engine rating is given as 30 hp at 1300 power strokes per min. The compressor delivers 106 cu ft per min at a pressure of 100 lb per sq in.

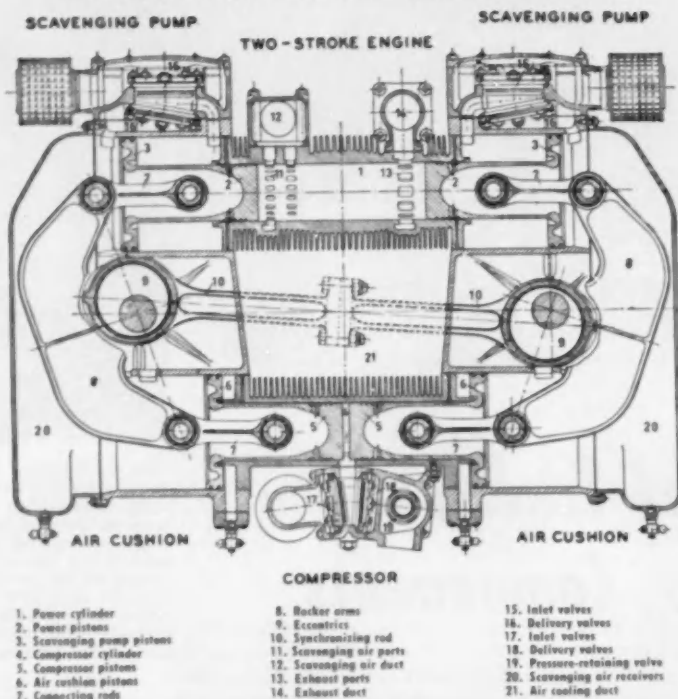
Starting is by compressed air obtained from a reserve tank. The compressor pistons are moved to inner dead center and air is introduced between them through the starting valve. As they are forced outwards the Diesel pistons meet on the compression stroke and fuel is injected through the central nozzle.

Bore of each piston is four inches which flanges out to eight inches at the skirt. These larger ends reciprocate in eight-inch bore extensions of the cylinders. Those on the compressor side move in valveless cushion cylinders as bounce pistons to give the flywheel

(Turn to page 124, please)

Free-piston Diesel-compressor with ducting from the turbo-blower and other equipment removed. Fuel pump is driven from rocker arm pivot shaft at left.

LONGITUDINAL SECTION OF THE FREE-PISTON DIESEL-COMPRESSOR.



# AUTOMATION NEWS REPORT

← FEEDBACK →

**AUTOMATIC CONTROLS**  
**PRODUCTION — VEHICLES — AIRCRAFT**

**By Paul Kennedy**

## COMPANIES EXPAND

Thompson Products, Inc., has arranged some \$20 million in preferred stock and credit financing for its electronics affiliate, Ramo-Wooldridge Corp. Thompson also has acquired another West Coast firm recently; Karl-Douglas Associates, Inc., maker of hydraulic and pneumatic control components.

Westinghouse announces it soon will construct a plant in the Pittsburgh area to make such control devices as transistors, rectifiers and photoelectric cells. The new plant itself will be highly automated.

F. Jos. Lamb Co. assets have been purchased by a group headed by Alfred C. Ryan as president. Lamb makes automation equipment. Air Associates, Inc., has agreed to merge with Great American Industries, Inc., according to AA president J. F. Ashman and GAI chairman R. T. Dunlap. AA manufactures a variety of aircraft and radio equipment, while GAI makes various electrical devices and rubber products. Magnavox Co. has entered the data processing field with the delivery to Douglas Aircraft of an analog-digital converter.

Kidde Automation Systems, Inc., has been formed by Walter Kidde Constructors, Inc., to make warehousing systems which the parent firm recently developed. William Collins is president of parent and subsidiary companies.

A display traveling around the country will show instruments and electronic devices. Beginning next March, the show will go to some 32 cities across the country. Richard Rimback Associates of Pittsburgh is sponsor. In England, a technical training school is being set up to teach engineers and others how to use automatic control equipment. Minneapolis-Honeywell Regulator Co. announced the school will be free except for living expenses. Last year the company's school in Philadelphia graduated 315, for a total of 4000 students in 20 years of operation.

## MEASURING FOR AUTOMATION

Automatic production systems often are developed as packaged units. Separate components of specialist makers also have their place, even in this day of single equipment contracts and consolidated specifications. Two new examples are measuring instruments for the

petroleum industry — an infrared gas analyzer and differential refractometer. They were designed by Phillips Petroleum for feeding information to automatic controls in refineries. Consolidated Engineering Corp. developed them into rugged production components. Automation — automatic feedback of errors in the various processes to an automatic controller or error corrector — in the refining and pipeline industries is still a relatively new thing, even though it has made more progress there than in the metalworking industries.

## SIMPLIFIES PROGRAMMING

Automatic programming devices have been designed by Remington Rand, Inc., to take some of the drudgery out of setting-up problems for data processing machines. According to J. E. Parker, vice-president for computer sales, the device is an adjunct to the computer itself and will reduce programming time from months to minutes. The user merely states his problem in plain English or in simple mathematics, for instance. Two new RR Univac-Scientific models were also announced recently. Metal tape in place of the plastic type makes these models now compatible with the commercial Univac and the new File Computer. Now used in missile programs, the scientific model soon will be available for flight simulation and control, and for industrial processes.

## PRODUCTION ENGINEERING EXPOSITION

at Navy Pier, Chicago, September 6-17 will  
feature equipment for handling, gaging and  
monitoring, as well as accessories for automation

## ELECTRONICS AND AUTOMATION

Electronic developments in recent years have perhaps been more spectacular than developments in some other fields. Yet applications of electronics in metalworking machinery have not come about nearly as fast as in consumer goods themselves, civilian or military. This situation may change in the near future, according to experts. Malcolm P. Ferguson, president of Benix Aviation Corp., pointed to some promising developments in a recent address. Combining ultrasonics with electronics, he said, we can visualize continuous cleaning of the products. "Miniaturization" of electrical or electronic components in metal products will be hastened, Mr. Ferguson explained, by

(Turn to page 100, please)

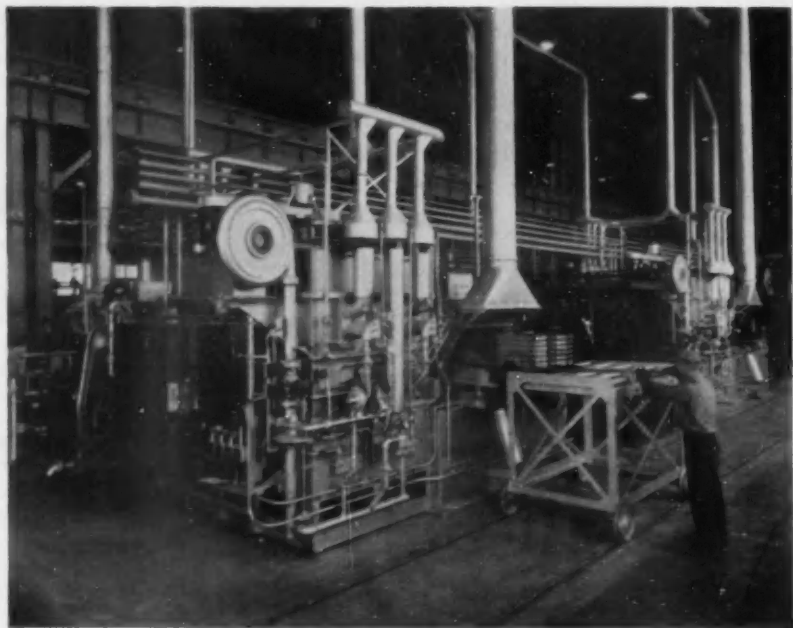
# Special Setup for Heat Treating

**S**AFETY from the standpoint of fire protection is the new dimension imposed on the integrated heat treating facilities for the Ford Livonia plant where automatic transmissions are produced for Lincoln and Mercury cars. Usual practice is to locate the heat treat department centrally between the machining and grinding departments so as to reduce materials handling. However, with this arrangement, a fire in the heat treat department could easily spread into the other two. To guard against this, heat treating is done in a remote corner of the enormous plant away from the manufacturing area, with provisions for sealing off completely in the event of any emergency. Although the course of materials handling has been lengthened and complicated thereby, the management feels it is a major economy in the long run by providing security against fire hazard.

The heat treating facilities, as will be noted later, represent the latest types of equipment known to the art, and encompass special design features in the interest of safety—for the plant, for the operators, and for the equipment.

The manufacture of automatic transmissions involves a complexity of parts as well as processing. Consequently, the selection of equipment was based upon some clear-cut considerations. For one thing, there are many miscellaneous parts too small for racking and not processed continuously. Ford elected to handle such parts in a group of automatic cycle batch type furnaces.

Another major class includes all manner of parts required in sufficient quantities to warrant racking and handling in continuous type automatic furnaces. Input shafts, requiring press quenching, are treated



Typical view of the Holcroft batch type carbonitriding furnaces is shown here. The miscellaneous parts, loaded in containers, are transported to the furnace on the manually wheeled truck, seen in this view, and pushed into the furnace through the vestibule door. The vestibule door is operated by means of the large air cylinder mounted on the base.

in controlled atmosphere rotary type furnaces, in which the parts are manually loaded and unloaded. In addition, planet gear shafts and inner and outer clutch races are selectively induction hardened in special setups to be noted later.

Let us consider the heat treating equipment more in detail. Small miscellaneous parts, primarily spool valves and similar small screw machine parts, as well as a variety of control levers are carbonitrided in batch type, gas-fired, radiant tube heated, automatic batch type furnaces. Six Holcroft furnaces of this type are installed for this purpose. Depending upon the requirements of a given part, the cycle includes either an oil quench within the unit or separate treatment in a Holcroft hot salt bath. Parts usually are drawn in Holcroft furnaces at a temperature range of 350-375 F; or in some instances in a high temperature Surface-Combustion draw furnace.

Certain parts such as planet gears and sun gears can also be processed in the batch furnaces, then given a salt bath quench.

# Greatly Reduces Fire Hazard

By  
Joseph  
Geschelin



One of the Tocco induction hardening machines for processing races. The cycle is fully automatic, chief function of the operator being to keep the magazines loaded.

A battery of four, large and fully automatic Holcroft pusher type furnaces is used for carbonitriding another group of parts, with moderate depth of case, and required in large volume. One of these furnaces, equipped with a high temperature draw furnace, is used almost exclusively for clean hardening, also processing some cast iron parts. One furnace, used for gears, is equipped with a hot salt bath quench tank. Another of these units handles spool valves and levers, required in large quantities, both with and without racking. The forward sun gear, requiring a case depth of around 0.030 in., is handled separately in another furnace.

Each of the Holcroft pusher type furnaces is gas-fired, with radiant tubes, and has a two-row hearth. Except for loading and unloading, the cycle is fully

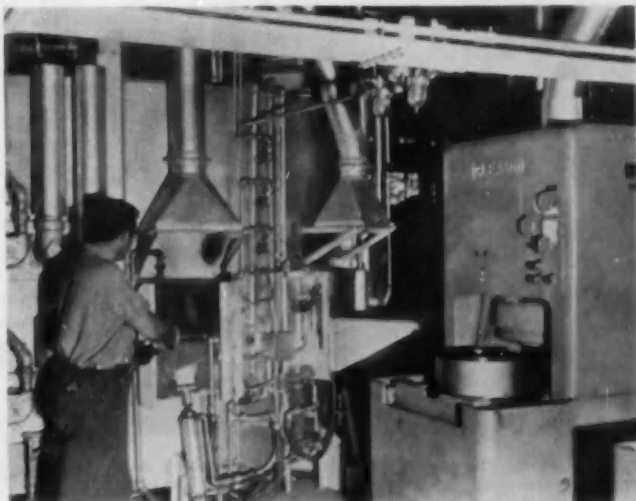
automatic and self-contained. Work enters the hardening furnace, then goes to quench, to the washer, the draw furnace, and out.

Races for overrunning clutches, requiring a case depth of 0.070-0.080 in., currently are being carburized in L & N Homocarb pit type furnaces in a cycle requiring about 18 hours. Hardening is done in a group of Tocco induction hardening machines, fitted with magazine feed, as shown.

Planetary gear pins, made in two different lengths, and requiring selective hardening are hardened in the special General Electric induction hardening setup illustrated here. For this purpose, the parts are fed to the coil from the automatic feed hopper and are fed through the coil by means of a special cam-operated mechanism. The objective is to harden only the center section, leaving both ends soft.

Output shafts, largest of the parts requiring heat treatment, are processed automatically through a group of two, large three-row Surface-Combustion pusher type carburizing furnaces. These, too, are gas-fired, and employ radiant tubes. They were built as a right- and left-hand unit, with air draw furnaces installed in between. The automatic cycle includes: carburizing, oil quench, wash and air draw, loading and

Input shafts are carburized in Holcroft rotary type furnaces, such as the one at the left. The operator unloads at the door seen here, loads at the platform to the right in the center. One of a battery of seven Gleason die quenching machines, serving the two rotary furnaces, may be seen at the right.

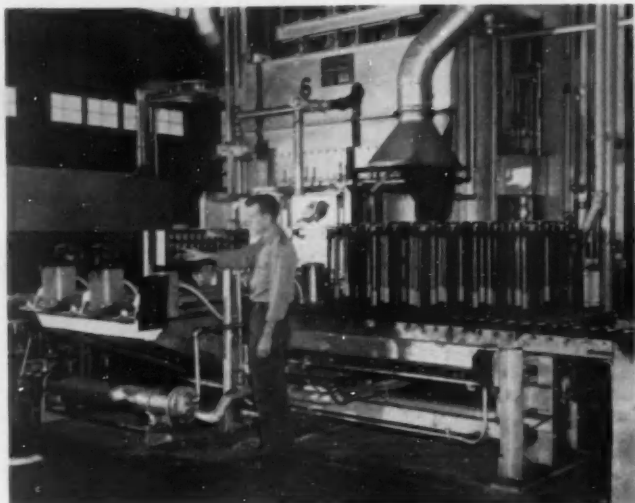


unloading of carriers being manual. The full cycle of events requires from 19 to 20 hours.

Input shafts—a slender shaft with a large gear at one end—normally susceptible to distortion—demand special treatment. To this end, they are carbonitrided in a battery of two, large diameter, Holcroft rotary type furnaces, manually loaded and unloaded three at a time. Loading and unloading doors are located close together to facilitate handling by an operator. As a batch is unloaded, the parts are removed by means of tongs and loaded into adjacent Gleason quenching machines. This is followed by washing and drawing.

One section of the department has been equipped with a battery of eight Surface Combustion Rx gas generators of endothermic type. They are connected in groups to a common manifold, arranged to feed all of the controlled atmosphere furnaces.

It is noteworthy that the oil quench baths in the various furnaces mentioned briefly above contain a total of around 30,000 gallons of oil. Special attention has been paid to the handling of quenching oil



Here is a view of one of the large Surface Combustion furnaces used for heat treating output shafts. They are of three-row, pusher type, with fully automatic cycle.

through a central system of storage tanks, recirculation, filtering, centrifuging and cooling. Focal point is the pump house, provided with three, 20,000-gal storage tanks, one of which is employed for recirculation, cooling and filtering, the other two being standby units to be used only if the entire system is to be withdrawn from the furnaces in an emergency. A large Delpark filtering unit is installed for filtering the oil. Before being recirculated, the oil is centrifuged.

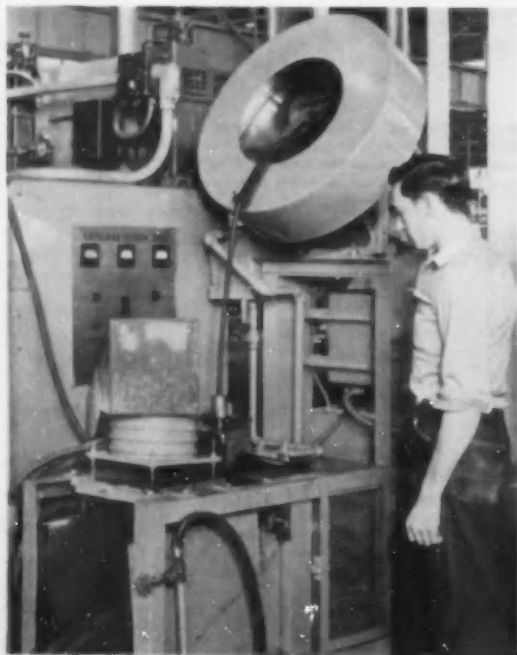
Major function of the central recirculating system is to maintain each of the quench tanks throughout the department at its specified temperature limit. Oil is held in the storage tank at 120 F and upon demand, if the temperature of any tank begins to exceed its specified value, the cool oil will flow into the tank automatically until the mixture temperature is normal. The displaced oil is returned to the storage tank for rectifying and made ready for recirculation.

As mentioned at the outset, safety is the prime consideration. For one thing, the entire department is protected by a sprinkler system. Superimposed on this are safety controls for the equipment as well as the operators.

Each unit is equipped with a remotely controlled dump valve. In the event of an emergency, the dump valves are triggered and the entire oil load will be withdrawn from the quench tank within a few minutes, flowing directly into the big storage tanks underground. In addition, Ford has provided an extensive CO<sub>2</sub> extinguisher system for blanketing the area around each oil tank.

One of the hazards in using controlled atmosphere furnace equipment stems from an undetected failure of the atmosphere gas supply, since at that time all furnace pressure is lost and air begins to infiltrate

(Turn to page 113, please)



Close-up of the General Electric induction hardening machine employed for selective hardening of two sizes of planet gear pins.

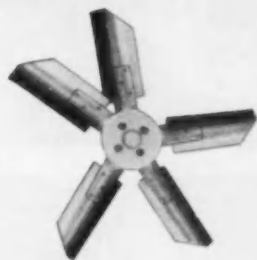
1918 TO 1955



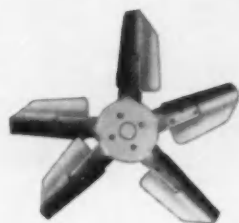
*from away back THEN until NOW*

# SCHWITZER-CUMMINS

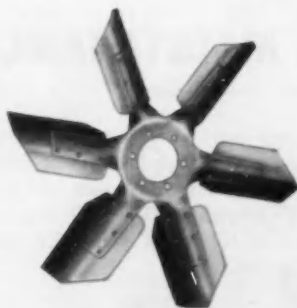
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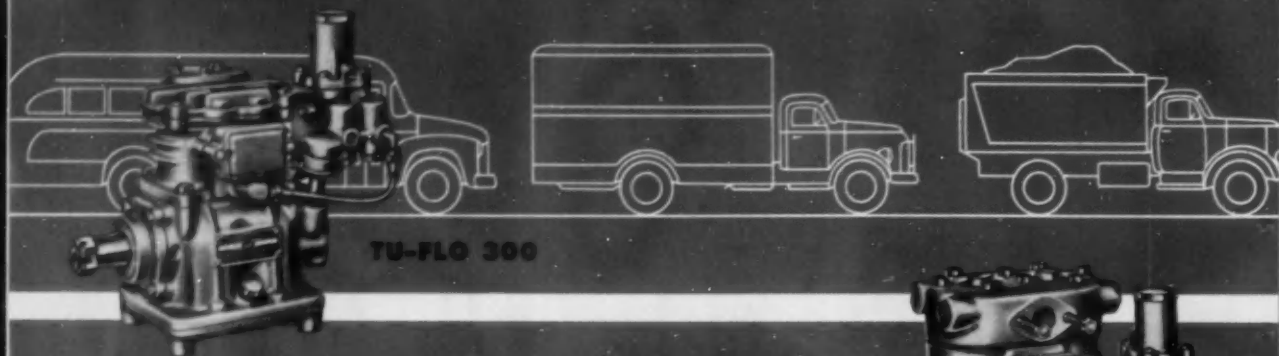
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- CRANKSHAFT  
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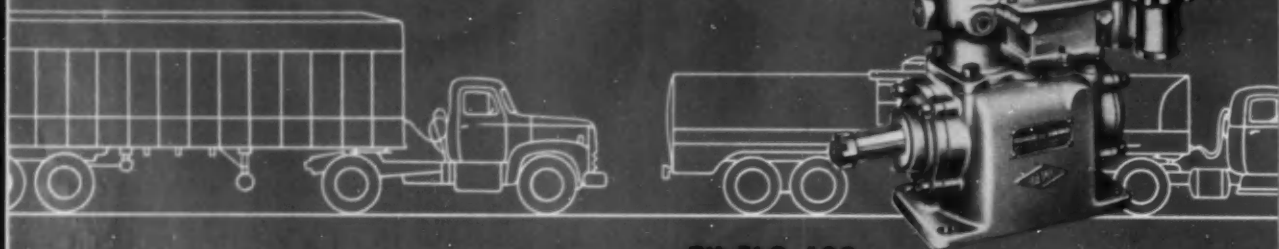
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# ENGINE BEARINGS

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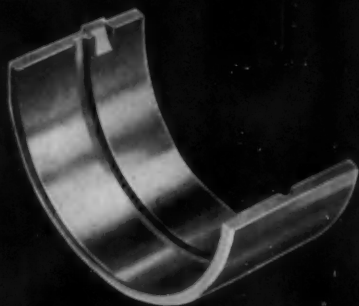
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**LATEST BAIRD MACHINES and TOOLING IN OPERATION**  
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**... IF IT'S A HIGH PRODUCTION PROBLEM ...**

**ASK**



**BAIRD**

**ABOUT IT**



**ANOTHER WORLD-FAMOUS PLANT**

**INSTALLS BATTERY**

**OF BAIRD CHUCKERS**

The photo above shows four of a battery of eight Baird 6-spindle automatic Chucking Machines performing the complete turning operations on aluminum alloy pistons . . . including automatic feed and discharge.

The Plant Manager says, "Previous methods of finish-turning required *four* separate operations. Now, the same results are attained in one operation . . . faster and with less chance of error." Cutting speed is 1332 to 1350 ft. per minute . . . feed per revolution .018 to .025. Actual cutting time at each station approximately 5 seconds . . . complete cycle 7.36 seconds.

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Write to Dept. AI

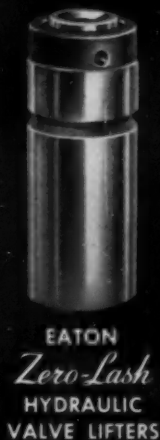
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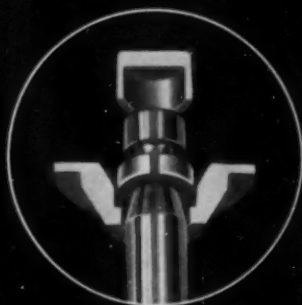
EATONITE  
VALVE SEAT  
INSERTS



# 5 Eaton Developments that Increase Valve Life



EATON  
SODIUM-COOLED  
VALVES



EATON  
FREE-VALVES



EATONITE  
EATONITE-FACED  
VALVES

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# News of the MACHINERY INDUSTRIES

By Thomas Mac New

## Builders in Varied State of Readiness for Show

In a recent editorial trip through parts of Wisconsin and Illinois, we learned that machine tool builders in that area plan to spend from \$13,000 to \$300,000 on the N.M.T.B.A. Show this September in Chicago. Builders in the area had their machine tools in varied states of completion. Some just had the bed laid, while others had machines in the Chicago Amphitheater. Most all will have new equipment ready for the opening. The smallest number of machines to be displayed by companies visited will be four while the largest number will be 26.

One company, a builder of transfer equipment, will have a model of its erection floor at the show. This floor is said to be one of the largest in the world for machine tools. According to a company executive, the erection area is a good selling point since there is room not only to build, but to test the units on production type runs.

## The Second \$100 Million

Tools to be purchased by the military out of the \$100 million recently approved by Congress will be for bottleneck-type items according to Asst. Secretary of Defense T. P. Pike who is in charge of Supply and Logistics. Tools will be selected on the basis of the types that would hold up production of high priority military end items in time of full mobilization. None of the tooling money is to be used for stock or shelf items. As Mr. Pike points out, all of it is being earmarked for procurement of "critical—15603" tools having long production lead-time. The Secretary disclosed that he is "making a special effort" to include in the tool buying program tools which are adaptable for producing not only end-items of current design, but also those end-items of improved design which are now in the engineering design and testing state.

According to Mr. Pike, the Air Force has task groups working with plane builders and machine tool manufacturers to select tools which are adaptable and which can be used with the greatest degree of interchangeability between current and future designs of planes.

None of the \$100 million will be spent for development of new prototype tools or allied equipment.

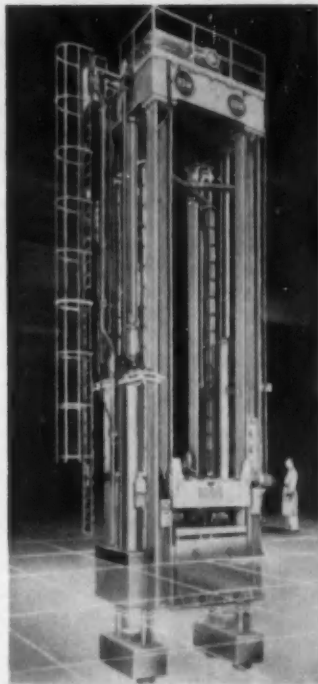
Tools that have been determined as necessary for the Air Force program are large skin and spar mills, profilers, milling machines, vertical and horizontal boring mills, large lathes, hydraulic presses, and some miscellaneous machinery.

Altogether, Congress has voted for \$200 million for the special tool program. That figure is only 40 per cent of the amount specified by Harold Vance when he made his now famous report on the tooling situation in W. W. II and the Korean War.

## Presses Plastic

H.P.M. has built a king-size molding press for reinforced plastic parts made by Zenith Plastics Co., Gardena, Calif. Hydraulic Press Manufacturing Co. officials state that the press has a capacity of 600 tons and a total weight of about 150 tons. The press stands over 63 ft high overall with 25 ft under the floor when installed. Platen size is 75 in. by 104 in.; stroke is 17 ft.

Machine Tools To Be  
Purchased By the Military  
Will Be of Types  
Necessary for Production  
of High-Priority  
Items in Time of Full  
Mobilization



Press built by H.P.M. for molding large reinforced plastic components at Zenith Aircraft Div. The press has a 600-ton capacity and a stroke of 17 ft.

## Oxide Cutting Tools

We hear that the Carboly Dept. of G.E. has developed cemented oxide-base cutting tool material. The new material, still in the laboratory stage, is Carboly's endeavor to keep pace with high speed machines currently under development by the machine tool industry.

Laboratory tests of the new tool material, according to Carboly engineers, indicate it provides good tool life at speeds of 2000 fmp. At a feed of 0.005 in. and depth of cut of 0.100 in. at that speed, the tool lasts 27 min. in turning 1045 steel with a hardness of 170 Brinell.

(Turn to page 128, please)



**NEW****PRODUCTION  
and PLANT****EQUIPMENT**

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

### Electronic Warehouse System

A NEW warehousing system takes full advantage of the bulk picking technique. The mechanics of the project were handled by Link-Belt Co., Colmar, Pa., which made the conveyors and sorting mechanisms. All electronic controls such as the five-channel analog paper-tape computer were made by Teleregister Corp., Stamford, Conn. The devices made by the two companies were integrated by Walter Kidde Constructors, Inc., New York, which developed the system.

Bulk picking can be achieved while retaining the desirable features of order picking. With the new system, approximately 25 per cent warehouse space can be saved. The device is also suitable for the scheduling of assembly parts on a continuous flow basis. Major portion of the warehouse floor is devoted to active storage for picking.

A typical section consists of eight-ft wide storage areas with alternate picking and stocking aisles. Incoming merchandise is handled by any one of a number of means, including fork trucks, tractor-towed trains or endless-chain pulled carts—palletizing or unpalletized. This equipment uses the stocking aisles when delivering material to storage.

Items handled in less-than-case lots are stored in gravity feed storage shelves. Above the shelves are racks for palletized storage of additional stock to supply the gravity shelves. Bulk or cased merchandise is floor-stacked or rack-stacked on pallets. On the picking aisle side, the stacks are maintained at the six to seven ft height so that the picker can reach a case easily; on the stocking side, the stacks can be 16 ft high or more. Roving stockmen work the stocking aisles to maintain the gravity shelves and the picking stacks. This system assumes first-in first-out movement of inventory.

All orders for a given work cycle are processed on punch cards, one for each item on each order. All cards are then arranged according to storage sequence, and given to the ware-

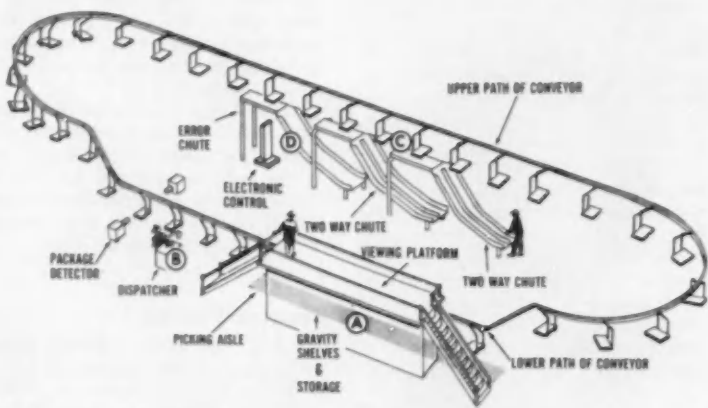
house picker. He starts at his first station, picks the amount called for on each card, and places the lots and the cards on a carrier tray attached to a moving conveyor. The speed of the conveyor and its position in relation to his height, arm length, etc., are arranged for his convenience. This sequence is repeated until all item cards have been processed and placed on carriers. At this time, all of the

signee's address—which is contained on the tabulating card.

2. It transports the merchandise and card to the dispatcher.

3. It discharges each carrier load at the collecting station assigned to a specific customer for packing, if necessary, and shipping.

The dispatcher removes the card from the carrier. He reads the discharge chute destination on the card



A Items selected from storage by punch card, placed on moving tray and transported together to dispatching area.

B Dispatcher removes and reads card, enters destination in key board. Alternate method to insert card into card reader.

C Electronic controls punch paper tape analogue. At destination, unloading cam removes item from tray. Gate directs to proper station.

D Dispatcher can rectify keyboard mistake with error chute. Photo-electric package detector removes all unaddressed merchandise.

A layout of the Kidde system in a proposed warehouse

orders have been picked and automatically sorted for this item. At the end of the cycle, the picker is at his last station and has completed all of his cards. The electronically controlled conveyors take over the job.

For the prototype model an overhead trolley conveyor was selected. The speed of the prototype model can be varied from 45 to 135 fpm, which means that 450 to 1350 picking carriers pass down the aisle per hour. The conveyor performs three main functions:

1. It provides a platform on which pickers can place and segregate a requested item together with the con-

veyor and punches the chute coordinates on the keyboard that activates the electronic controls on the conveyor. Or, with an electronic card reader, he simply removes the card from the carrier and inserts it in the card reader.

In the prototype, an electro-mechanical analog of the conveyor is used for control. A five-channel coded tape advances with the conveyor and punched holes, which simulate the carriers, identify the discharge station. Switches and relays are activated by the moving carriers to coordinate tape movement with conveyor movement. Kidde Automation Systems, Inc.

Circle 46 on postcard for more data

## Profile Miller and Grinder for Blades

Two larger profiling machines have been developed for milling and grinding, respectively, the airfoils of forged jet engine compressor blades. These new machines, Style 186 for milling, and Style 187 for grinding, accommodate blades having airfoils up to six in. wide and 18 in. long.

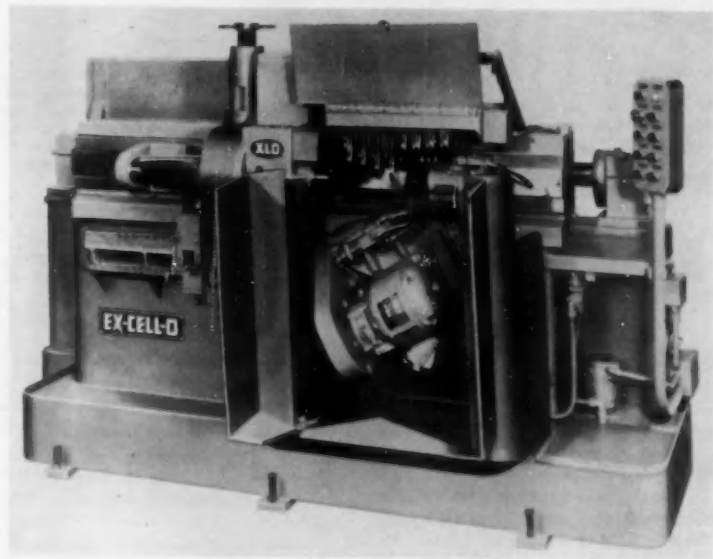
The precision profile miller, like the smaller Style 86 introduced several years ago, has a precision milling spindle with its drive motor mounted on an angular side on the front of the machine base. It is currently being used on titanium as well as stainless steel. The work feeds lengthwise across the milling cutter, and indexes radially after each cutting stroke. The position of the blade relative to the cutter is maintained at all times by an accurately ground steel cam on the

work head, which engages a follower on the machine base. By this arrangement the work head pivots up and down during the milling cycle to obtain the required form on the blade.

Roller type back rests are brought into contact with the work, and are locked hydraulically before each cutting stroke. These rests do not exert pressure on the blade, but they afford firm resistance to cutting pressure.

The grinder uses the same type of cam to control the height of the work in relation to the grinding wheel. The blade rotates and feeds across the wheel in the grinder. Both of these profiling machines perform their work automatically after the blade has been loaded and the cycle started. *Ex-Cell-O Corp.*

Circle 47 on postcard for more data



Profiling machines for jet engine blades

## Cutting Carbides

Two new types of cemented carbides for use in the machining of steel replace older grades at no extra cost. A new anti-cratering ingredient called Crystalloy is reported to give superior performance in tungsten-titanium carbide cutting grades. In producing the material, titanium metal is used in place of titanium dioxide as a basic raw material. Greater impact strength combined with maximum crater resistance is obtained.

CA-610 is designed for use where breakage is the factor limiting tool life. In the machining of steel, where

cuts of  $\frac{1}{4}$  in. or larger and feeds of over 0.015 in. are used, the chip loads on the cutting tool increase to the point where the normal factors usually involved in tool failures are not considered most important, but rather the problem is to overcome tool breakage. This is also the case where the cuts are extremely heavy and the surfaces uneven, causing the cut to be interrupted, for example, the turning of a square bar to a round.

CA-608 is recommended for light machining and finishing where the conditions limiting tool life are edge wear and cratering. *Carmet Div., Allegheny Ludlum Steel Corp.*

Circle 48 on postcard for more data

## Solenoid Valve

Dry solenoid servo valves recently announced are proportional type, electrically actuated, hydraulic, four-way valves in which the torque motor is isolated from the hydraulic fluid. They are designed for control systems in which the hydraulic fluid contains entrained iron or other agents which impair torque motor operation.

The valves feature high dynamic response, sensitivity, and linearity in hydraulic systems of from 1000 to 3000 psi pressure. Units having maximum output flows from 0.1 to 50.0 gpm for rated control currents between 2.0 and 40.0 milliamperes are available as specified. Conventionally, the valve input is from a balanced push-pull d-c amplifier and the valve flow output is applied to a piston or hydraulic motor. An electrical signal proportional to piston position or motor angular rotation is fed back to the amplifier to give a closed servo loop. Loop natural frequencies of 95 cps can be obtained for an unloaded servo with an uncompensated amplifier. Equivalent time constants are  $1\frac{1}{2}$  and three milliseconds from input differential current to output flow.

Model 2000 weighs 11 oz and has a maximum overall dimension of 3.06 in. It is constructed of an aluminum alloy body with a hardened steel valve bushing and spool assembly. All leakage is internal and is vented to the drain port. Various types of electrical connections are available, including pigtail leads, solder type terminals, and connections that will match AN plugs and Winchester M4S receptacles. Typical applications are servo system for machine tools, and for missile and aircraft flight control.

Dry solenoid valves contain a frictionless first stage push-pull hydraulic amplifier which requires a continuous oil flow of 0.1 gpm. This oil is internally filtered by sintered bronze elements. The input element of this stage is the polarized solenoid coil of a torque motor that is isolated from the hydraulic fluid. The torque motor armature passes through a tubular, sealed and frictionless pivot to actuate a flapper between two nozzles, thus creating a pressure differential proportional to the applied signal. This differential hydraulic pressure output is applied to the valve spool ends in opposition to two return springs to position the valve spool. *Moog Valve Co., Inc.*

Circle 49 on postcard for more data

## Special Multi-Spindle Head

**T**HE special 41-spindle head provides a number of interesting features. This head consists of a master drive box which operates in horizontal position. It is mounted and keyed on a hydraulic slide and provides 11 spindle pot heads for drilling, chamfering and reaming, and an 8-spindle individual lead screw pot head for tapping  $\frac{1}{2}$  in.-29 holes in a steel forging.

The three pot heads are driven through the master drive box by a 15-hp motor through a flexible coupling. The motor in this case is mounted on the hydraulic slide. Two wing brackets, also mounted on the hydraulic slide, are bolted to the rear face of the master drive box.

This head operates in conjunction with a five-station trunnion type fixture. Bushing plates used with the three pot heads are not shown. Brackets bolted and doweled to the front face of each pot head carry these bushing plates.

Jet type oil lubrication is furnished for the main box and the three pot heads. Grease lubrication is furnished for the lead screw tapping pot head. The individual lead screw pot head is totally enclosed with vented type grease fittings. In this type of construction the heat treated lead screws on the spindles, also the bronze lead screw nuts, are protected. The lead screw portion of the head is furnished with spindles having the maker's safety tap holder. This special holder prevents tap breakage due to bottom tapping, hole not being drilled to sufficient depth, or not drilled at all. If any one of these conditions exists, the tap will stop and upon retraction of the lead screw spindles with the tap, the spindles will automatically reset themselves.

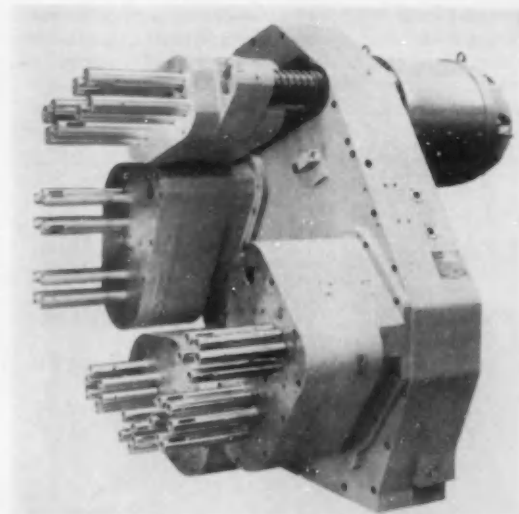
The lead screw spindles and their spline drivers are protected from jamming at the ends of the forward or reverse strokes due to incorrect setting or failure of the rotary limit switch by means of two safety switches.

The zero speed plugging switch is used instead of a brake. This switch plugs the tapping motor at the end of the reverse stroke. Following the plugging action and in a fraction of a second the motor speed is reduced to approximately 100 rpm, at which point the current is cut out. The decelerating momentum and friction in the tapping head brakes the remaining speed to zero.

After energizing the start cycle button and with the drilling, chamfering and reaming spindles rotating, the hydraulic slide with the head moves forward and into its feeding stroke. The lead screw portion of this special head has not at this point started its cycle. The forward portion of the lead screw spindle pot head comes to rest and locates on the main trunnion fixture frame. The forward motion of the hydraulic slide trips an electrical contact switch which starts

the tapping motor. While the eight individual lead screw tapping spindles are moving forward and returning individually in the tapping pot head, the drilling, chamfering and reaming pot heads are performing their operations with the forward motion of the hydraulic slide. The individual lead screw tapping pot head will complete its operation and the motor stop by means of the zero speed plugging switch before the main hydraulic slide starts its return stroke. *U. S. Drill Head Co.*

Circle 50 on postcard for more data



Special multiple spindle tapping head built for a machine tool maker has a  $2\frac{1}{2}$ -in. spindle stroke, but other strokes are available.

## Timer

**T**HE Atcotrol automatic reset timer with dial setting is designed for high accuracy, compactness, extreme flexibility, and low cost for timing and sequencing of electrical load circuits on industrial machinery and process operations. It has a one-piece injection-molded acrylic front piece, serving as a dust-proof cover and seal for the dial; vacuum metalized decorations and hot stamped graduations on inner surface.

Quick external inspection can be made of timer motor operation, clutch engagement, elapsed time pointer operation, pointer reset and load switch actuation, without interrupting operation or process. A unique "guillotine" impingement clutch (metal-to-neoprene) with double bight combines advantages of multiple-tooth and friction clutch disk arrangements but eliminates wear and slippage problems. Interchangeable dials and motors make possible 10 timing ranges

from 0 to 15 seconds, with minimum setting of  $\frac{1}{4}$  second, to 0 to 240 minutes with minimum setting of 240 seconds. *Automatic Temperature Control Co.*

Circle 51 on postcard for more data

## Hand Welding Gun

**I**NTERCHANGEABILITY of parts between the various gun types is the feature of a line of portable resistance welding guns. All cylinders, pistons, shunts, and piston shafts of the C type gun unit also fit other models of this manufacture. These guns incorporate an extra long bushing, exceeding length of stroke. Jaw extensions also are interchangeable. There are no hidden nuts and bolts. Operating components meet JIC and RWMA classifications. All parts, electrodes, adapters in these units can be changed without special tools. *Craft Welding Equipment Co.*

Circle 52 on postcard for more data

## Titanium Brazing Process

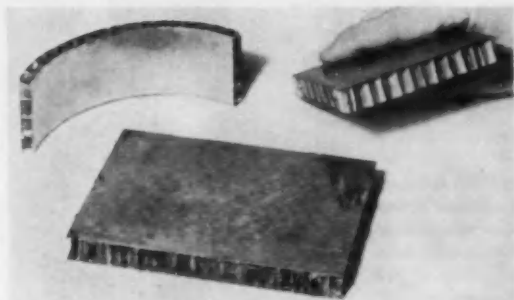
**A** TITANIUM brazing process which requires lower-than-normal brazing temperatures can be used with silver or silver manganese brazing alloy. It will fabricate an all-titanium alloy assembly or to join titanium to stainless steel or other alloys.

The method requires no fluxes and permits multiple brazing operations. In nature, the process is a form of vacuum brazing. Distortion does not take place because the temperatures used are below the normal brazing temperature. The process avoids embrittlement and difficulties generally associated with high temperature brazing of titanium.

Wetting and flow characteristics

are said to insure complete brazing of all joints, regardless of contour or position. Honeycomb sandwich sections are assembled with brazing alloy shim strips separating the titanium honeycomb from the two titanium face sheets. The assembly is then placed in a retort and weighted to insure positive contact of all components with the brazing alloy during the brazing process. The retort cover is then lowered and clamped, and the retort placed in a vacuum furnace where the actual brazing process takes place. Following brazing, the section is trimmed to final size. *Wall Colmonoy Corp.*

Circle 53 on postcard for more data

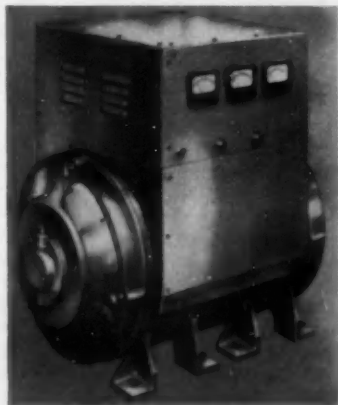


Typical titanium assemblies successfully brazed by Wall Colmonoy vacuum brazing process. It is not limited with regard to size or shape of part, contour or position of joints.

## Voltage Regulator

**T**HE RX400 all static voltage regulator is designed to provide precise voltage regulation to  $\pm 0.5$  per cent for 400-cycle generating equipment under all load conditions. Usable for direct excitation, the RX400 eliminates the need for a rotating d-c exciter. *Inet Div. of Leach Corp.*

Circle 54 on postcard for more data



Inet voltage regulator

## Systems Tester

**M**ODEL 250F Functional Tester has been designed for testing multiple complex relay systems. It has a capacity of 200 test positions with provisions for the operation of a series of external relays in any position. Every type of complex, interconnected relay system can be tested for errors in continuity-discontinuity and shorts, automatically. A programming board permits choice of circuit testing sequences for various combinations of normally open or normally closed relay contacts. *Dit-Mco, Inc.*

Circle 55 on postcard for more data

## Two Organic Brighteners

**T**wo new organic addition agents for use in acid copper sulfate electrolytes are now available. Wes-X 303 acid copper addition agent is for heavy build-up applications, specifically designed for plating electroformed shapes. With the new addition agent it is possible to obtain smooth, dense copper deposits with an exceptionally fine-grained structure and plating speeds can be in-

creased with freedom from nodular formation and treeing.

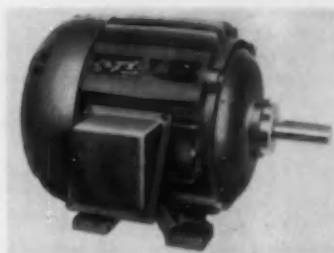
Wes-X 304 acid copper addition agent permits the economical deposition of bright, ductile copper for decorative purposes. The deposit is characterized by a high degree of leveling and grain refinement. The new addition agent makes possible wider bright plating ranges and use of higher current densities over an extended temperature range. *Electroplating Projects Dept., Westinghouse Electric Corp.*

Circle 56 on postcard for more data

## Redesigned Motors

**S**TANDARD and explosion-proof totally enclosed motors just announced feature corrosion-resistant cast iron frames, improved winding insulation and heavy duty ball bearings.

Grease fittings are provided at top and bottom of the bearing housing to permit convenient lubrication and removal of old grease. A running shaft seal on each end of fan-cooled motors and on the drive end of non-ventilated motors is designed to prevent the entrance of moisture, dirt and other contaminants which might injure the bearings. Pressure-cast aluminum squirrel-cage rotors are dynamically balanced.

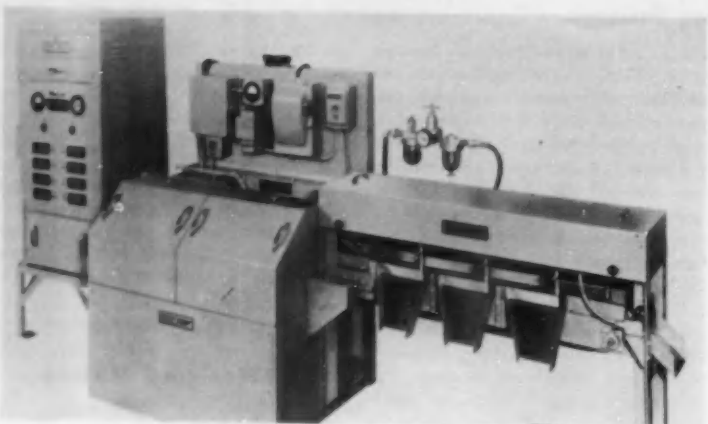


Standard TEFC motor, 215 frame, showing typical construction of ratings three through 10 hp.

Current production includes ratings one through 10 hp four pole, 60 cycles in rerated NEMA frames 182 through 265U. Frames 213 and larger are cast with heavy ribs for efficient cooling. A smooth-running, external fan of bronze or malleable iron effectively cools the motors and prevents dust from collecting on the frame. The flow of air is directed around all sides of the motor by a protective cast iron shield. Smaller ratings are totally enclosed, non-ventilated. *Wagner Electric Corp.*

Circle 57 on postcard for more data

## NEW PRODUCTION and PLANT EQUIPMENT



### Weights Rods Automatically

An automatic weight classification machine has been announced for weighing connecting rods for reciprocating type engines. The Selectrol model 651-8 is designed for direct insertion into a powered conveyor type production line. It weighs and sorts connecting rods automatically into eight weight classifications. An intermittent drive-power feed mechanism is incorporated for loading and unloading the scale at rate of 20 pieces per minute. (Exact Weight Scale Co.)

Circle 58 on postcard for more data

### Die Transfer

THIS special die transfer attachment for a standard 2000-lb electric truck consists of two platforms arranged one above the other. Ball transfers are set on the fixed lower platform. The top platform of formed steel plate has openings directly above the ball transfers. It is fixed to the lower platform by a hinged arrangement and is actuated by means of a hand hydraulic pump.

When the top platform is in the lowered position, the ball transfers protrude above its surface to allow easy movement of heavy dies. Removable pins, set into corner sockets,

prevent the die from rolling too far. As the top platform is raised above the ball transfers, the die rests solidly on the flat surface for safe transportation. Raymond Corp.

Circle 59 on postcard for more data

### Welding With CO<sub>2</sub>

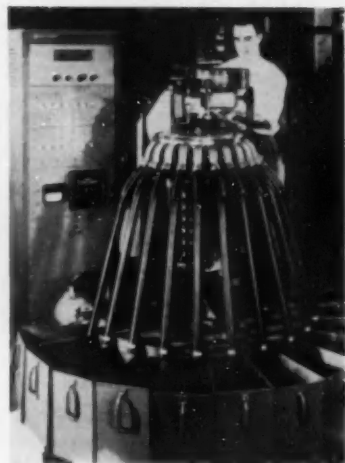
AN automatic welding process known as "C-Omatic," which uses low-cost carbon dioxide gas for shielding the arc while welding mild and medium carbon steel, has been announced. Similar in operation to the shielded inert-gas metal-arc process known as Sigma or Aircomatic welding, the development was initiated because commercially available automatic welding heads used with argon or helium gases were limited in application, due mainly to the high cost of shielding gases, particularly on fabrication of carbon steel products. The process is said to offer the advantage of low-cost automatic welding with a visible arc, without flux. The cost of carbon dioxide is approximately one-half to one cent per cu ft, as compared with six cents per cu ft for helium and eight to nine cents per cu ft for argon. Tests have shown that the quantity of carbon dioxide gas required is approximately half of that needed when helium or argon are used. Cost per hour of welding with carbon dioxide is said to be \$.30 per hour compared with \$4.20

per hour using helium, or \$4.80 for argon.

Filler wire of special formulation is fed to the welding head by means of powered rollers. The nozzle on the welding head consists primarily of a contact tube, water cooled jacket and a gas-shielding jacket. All major metal parts are brazed together. The nozzle is designed to provide a shield of gas around the wire the full length of the contact tube, minimizing the tendency to draw air into the arc. The contact is sufficiently long to provide good electrical contact, and is easy to remove. A. O. Smith Corp.

Circle 60 on postcard for more data

### High-Speed Sorter



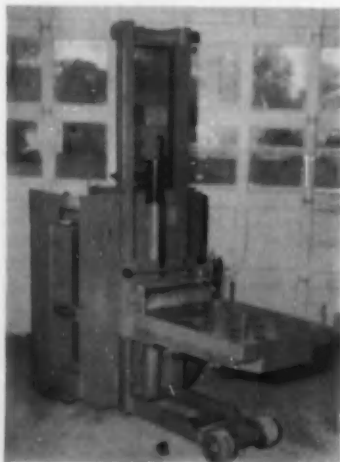
Completely automatic, this hopper-fed electronic gage measures the O.D. of precision ball bearings, 1/2 to 17/32 in., and sorts them into 12 good classifications of 0.00001 in. each plus oversize and undersize. The operating speed of model 143 B-18 is adjustable to sort bearings up to 24,000 per hour. (Federal Products Corp.)

Circle 61 on postcard for more data

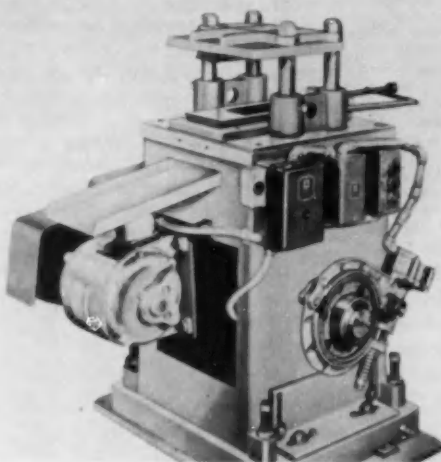
### Oxygen Sealant

A graphite product, "dag" Dispersion No. 217, having unusual antisize properties, is a ready-to-use paste of semi-colloidal graphite in a special carrier developed specifically as an anti-seize and sealant for high-pressure oxygen systems. Dispersion No. 217 possesses positive anti-seize properties at oxygen pressures as high as 2000 psi and at temperatures ranging from 160 F to -65 F. It is said to be completely non-inflammable, even in the presence of high-pressure oxygen at temperatures of 575 F and higher. Acheson Colloids Co.

Circle 62 on postcard for more data



## Flying Cut-Off Press



Designed to provide accurate high-speed production on cut-off of roll formed metal shapes, a line of flying cut-off press operate at 240 to 300 rpm. They range in capacity from four to 120 tons. Features include: Flag trip or positive mechanical run-out table to suit requirements; simplified adjustment of height and lateral requirement; air clutch with air brake on eight to 120-ton units; upper and lower die slide and bolster plate. (Dahlstrom Machine Works, Inc.)

Circle 63 on postcard for more data

## Balances Automatically

HORIZONTAL static-dynamic balancing machines feature a highly sensitive Electrodyne electronic indicating system. For the selected plane of correction, angle and amount of unbalance are shown automatically on



Olsen Electrodyne balancing machine

two large meters mounted in the face of the control panel. The plane of correction is changed quickly with the pivot shifter which assures positive plane separation.

Calibration of the indicating system can be checked or changed at any time with the aid of a screw driver. Full scale on the amount meter can be set to indicate any desired amount of unbalance. *Tinius Olsen Testing Machine Co.*

Circle 64 on postcard for more data

## Hazard-Proof Motors

UNDERWRITERS' approval has been received for explosion-proof motors for use in all Class I, Group D, and Class II, Groups E, F, and G hazardous locations. Stocking problems are greatly reduced because a single motor can be used for most hazardous locations. These explosion-proof motors are available in ratings of one to 25 hp, three phase and one to three hp, single phase. Modifications of the three-phase motors are also available with Underwriters' approval for use in Class I, Group C, hazardous locations. *Louis Allis Co.*

Circle 65 on postcard for more data

## Air Couplings

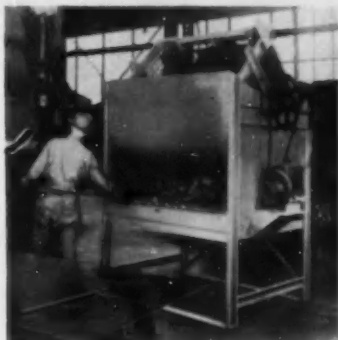
H-I-L-O speed couplers and connectors for air lines have been announced. The coupler valve gives higher-volume air passage, remains airtight under high pressure, and is made of stainless steel. It is linked to a compressed-air source with hose or tubing, and the connector is attached to air-operated equipment. Plug-in action snaps coupler and connector together, without need of twisting or turning. Swivel action of coupler prevents kinking of hose. The "10" series for 1/4-in. hose includes 1/8, 1/4, and 3/8 in. male and female pipe threads and 3/16, 1/4, 5/16 and 3/8 in. hose inserts. The "20" series for 3/8-in. hose includes 1/4, 3/8 and 1/2 in. male and female pipe threads and 1/4, 5/16, 3/8 and 1/2 in. hose inserts. The "30" series for 1/2-

in. hose includes 3/8, 1/2 and 3/4 in. male and female pipe threads and inserts.

Within any given series, such as the "20" series, all couplers and connectors can be used interchangeably, and will fit many other makes. Standard units are made of cadmium-plated steel with stainless steel valve. Equivalent sizes will soon be available in brass, stainless steel and aluminum. *Aro Equipment Corp.*

Circle 66 on postcard for more data

## Box Rotor



A low-speed gear operated box rotor with feeding stand for dumping any size container is operated manually. Boxes of wire, steel, wood, or combination can be handled as the rotor and stand are of heavy duty all steel reinforced construction, built to customer specifications. *(Palmer-Shile Co.)*

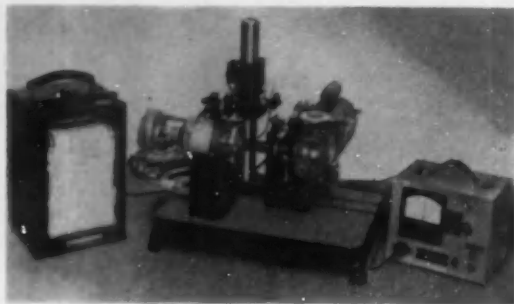
Circle 67 on postcard for more data

## Gas-Electric Power

SMALL size gas-electric power units for motorized walkie and small rider-type trucks combine instant starting, constant full power supply, easy accessibility and quick truck-to-truck interchangeability. In model W, engine generator, muffler, fuel tank and all accessories are enclosed within a standard housing, with no external projections. The top cover, which may be lifted off for access to oil dip stick, carburetor and radiator cap, is either recessed or flat to accommodate rider-type or walkie trucks. The louvered end panels and sides are readily removed thus completely exposing generator and engine.

Newly incorporated features include a 12-volt electrical system, battery-energized truck contactors for choice of idling speeds, and positive type governor. *Ready-Power Co.*

Circle 68 on postcard for more data



The equipment shown is recording over-all runout and bar-to-bar step measurement of the commutator in an assembled electric motor. The motor is held in a V-block, and is driven by a variable-speed motor. The gage head is positioned with its stem extending through a hole in the motor housing, with the tip in contact with the commutator.

### Gage Records Runout

A PEN-DRAWN chart record of the runout of rotating parts is obtained from a gage recently announced. It can be used to check the runout of rotating elements in assembled units where the rotating part can be reached with an external probe. Two sensitivities are provided—0.000010 in. and 0.000050 in. per chart division—and can be used interchangeably.

This instrument includes an adjustable gage head, mounted on a saddle on a vertical column, a drift-free electronic amplifier connected to the

gage head, and a high-precision recorder, connected to the amplifier. It also includes appropriate means for holding the unit being tested, and for driving the rotating member at the desired speed.

The gaging and recording elements are the same for all applications, except that amplifiers of various sensitivities are furnished as required. The gage head support, work support and work drive are engineered to individual requirements. Cleveland Instrument Co.

Circle 69 on postcard for more data

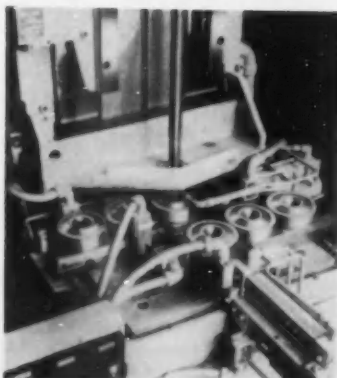
### Automated Broach

THIS vertical type automatic pull down broaching machine is designed for automatic conveyor line operation. Equipped with electrical controls and a hydraulic broach retriever, the machine automatically broaches the hole and involute splines in an automatic transmission clutch hob. To provide alignment of the broach, the retriever follows the broach down during a principal portion of the broaching stroke. As the broach is pulled through the part, the retriever follows at a rate which holds the broach in tension.

The machine automatically receives the parts coming in from the line, broaches them, and then ejects them back onto the line. Parts coming in actuate a loading cylinder which transfers a part into broaching position. A hydraulic lift lowers the part until it seats against the inner boss of the previously reamed hole. The retriever lowers the broach through the part until the shank connects with the automatic jaws of the broach puller. The part is broached, the lift raises the part and an ejection cylinder ejects the part back onto the conveyor line. The broach is then returned to the retriever and the cycle

automatically repeats. The machine runs continuously as long as parts are coming in from the conveyor line.—American Broach & Machine Co.

Circle 70 on postcard for more data



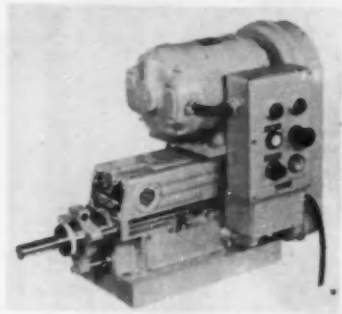
Pull down broach for continuous operation

### Drilling Unit

DEVELOPMENT of a new self-contained hydraulic power unit for drilling, reaming, counterboring, spot facing, and chamfering is announced. A variable delivery hydraulic pump is an integral part of the spindle and quill. Hydraulic feeding thrust is ap-

plied directly behind the spindle. A so-called Locked Circuit Feed is designed to maintain a constant pre-set and uniform feed-cycle, regardless of oil temperature.

The tool is completely automatic. An emergency cycle return button is provided on the front of the unit and rapid traverse is controlled by limit switches on the side. Model 500 is said to have unlimited reverse thrust at all spindle speeds, infinitely variable rates of traverse, positive depth



Hydraulic drill head built to JIC standards

control, thrust control, and infinitely variable feed rate. Spindle drives may be V-belt pulley, direct motor, gear reduction or transmission.

The unit is especially adapted for multiple drill applications. It may be mounted in any position. It is available in standard feed cycles, jump gap and dwell. This unit can be supplied with a time delay at the end of the feeding stroke for accurate facing-to-depth operations. It drills up to 3/8-in. diameter holes in steel and larger in certain other types of metals, castings and forgings.

The hydraulic drill unit can be supplied with a safety light which tells the operator it is time to change dull drills. This particular model has a depth control of 0.0005 in. It has a maximum stroke of five in. and its thrust reserve can be as much as five times the requirements. On finishing a drilled hole there is no forward surge of the drill. Drillmatic Co.

Circle 71 on postcard for more data

### Index Table

AN electric indexing table for automatic work-positioning features a central column on which tools may be mounted. The new table is available both as a packaged unit with the company's electric impact hammer which stakes, rivets or marks auto-

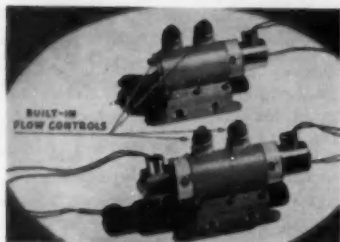
matically with the cycling of the table, or separately. The built-in automatic timer is continuously adjustable from six to 54 indices per minute and automatically triggers the tools when the table locks in position. A 1/20-hp gearhead motor, running continuously, furnishes the power.

The automatic timer triggers a solenoid that operates a clutch on a cam. With each rotation of this cam, a nylon roller advances the table one station with a Geneva action. Eight stations are available at present. The 15-in. table is locked securely by a ground pin engaging hardened, tapered bushings set in the table. Repeat accuracy is 0.001 in.; no backlash can occur. *Black & Webster, Inc.*

Circle 72 on postcard for more data

### Pilot Valves

**B**ASE mounted, air-control units are designed to meet JIC standards and are recommended for machine applications where continuous operation



Pilot-operated air valve

and compact piping are needed. Double and single-solenoid, pilot-operated control valves are available.

Both have built-in flow controls which make them dual-purpose valves. There are only two internal moving parts: a single balance spool-type stem that rides on aircraft-type packing (replacing the O-ring packing renews the main valve body) and the solenoid pilot plunger with molded-in seats. The double-solenoid valve has two solenoid pilot plungers. The entire unit is completely sealed.

The double-solenoid model SS can be energized through a Micro-Switch or a relay. Being dual solenoid, it is a momentary-electrical, contact-type valve. There is no need to energize it continuously, although the valve must be mounted on its horizontal axis. The single-solenoid valve has a spring return for electrical control and electrical contact must be maintained for the duration of the cycle.

The solenoids are rated as continuous duty. Recommended pressures

are from 20 to 150 psi air pressure for the double solenoid and from 35 to 150 psi for the single solenoid. *Air-matic Valve, Inc.*

Circle 73 on postcard for more data

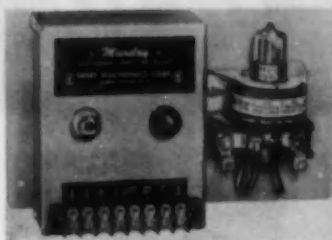
### Fluid Motors

**F**LUID motors for applications up to two hp have been announced. They feature an exclusive gear tooth structure which is designed to eliminate any vacuum condition and detrimental aeration and foaming. One size provides 15 capacities with varying gear face widths. *John S. Barnes Corp.*

Circle 74 on postcard for more data

### Mercury Relay

**T**HE Micrelay is offered for control of high power, high current loads up to 60 amp or three hp from very

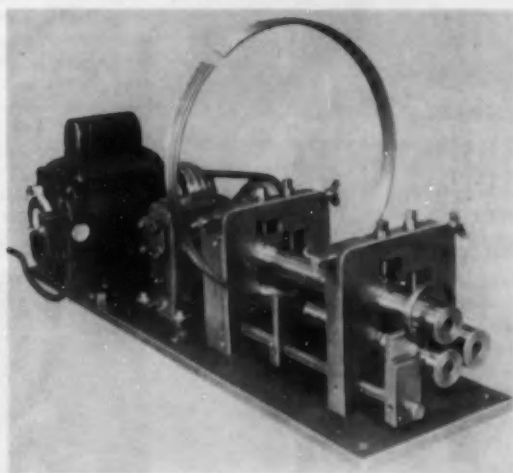


Ebert Micrelay

low current, low power devices or circuits. It is a-c operated without rectifiers or armature-type relays. Built-in power line isolation permits full flexibility of external control circuitry. This instrument employs one type 2D21 miniature thyatron tube and also includes a mercury plunger relay with 35 or 60-amp contact rating at 115 vac. *Ebert Electronics Corp.*

Circle 75 on postcard for more data

### Wire Ring Roller



This machine will roll rings of round or flat wire, from two to 30 in. diameter. It will handle two 5/16 in. diameter wires or five 3/16 in. diameter wires. (*Penn Machinery Co.*)

Circle 76 on postcard for more data

### Tonnage Raised

**B**Y redesigning, two tons are now delivered by a former one ton press. Four ton press now has a five ton capacity while the 7 1/2-ton model now delivers eight tons.

These new presses are available in standard OBI inclinable types, as well as a deep throat model, back-gear models and half-presses. Latest improvements include a new oversize clutch design. The sliding key is now contained in a large steel collar taking the entire load off the crankshaft keyway. Brake size has been increased, with ram stopping on top

dead-center after each stroke. *Benchmark Manufacturing Co.*

Circle 77 on postcard for more data

### Motor Control Relay

**M**AGNETIC motor controller a-c relay series 210-UM carries full Underwriters' Laboratories approval. It is available in any standard arrangement of contact combinations. Coil voltage in the unit is 115 volts, 60 cycles. Contacts are rated at 115 v, 60 cycles, single phase, 1/4 hp. *Guardian Electric Manufacturing Co.*

Circle 78 on postcard for more data

# NEW

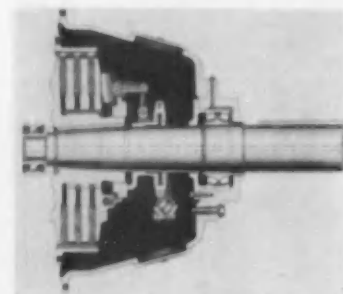
# PRODUCTS

## AUTOMOTIVE - AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

### Friction PTO

A heavy-duty friction power take-off, model SP-314, is designed for engines in the 225 hp class, operating in the 2200 rpm range. The unit accommodates an SAE No. 9 flywheel. With triple drive-plate construction, it assures ample friction surfaces to with-

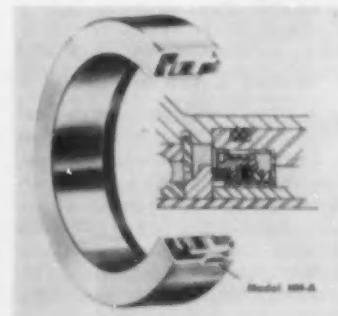


stand excessive heat. The pilot bearing is composed of a single row of balls, operating in bearing races of double-row width. The clutch shaft is drilled to provide for relubrication of the pilot bearing in the conventional manner. Spherical bearings are used to provide maximum resistance to overload, or destructive forces from heavy slide loads. It is in effect self-aligning. *Twin Disc Clutch Co.*

Circle 26 on postcard for more data

### Shaft Seal

Type HH shaft seals are said to provide effective shaft sealing in minimum space (both radial and axial) under extreme operating con-



ditions of temperature, pressure and seal face surface speed. They use a wave spring to maintain axial pressure loading. Only that pressure which, added to the spring pressure, is needed to seal effectively, is used. They incorporate synthetic rubber, Teflon and Kel-F. Type HH-A is shown in pressure balance when fluid pressure is applied externally. *Gits Bros. Mfg. Co.*

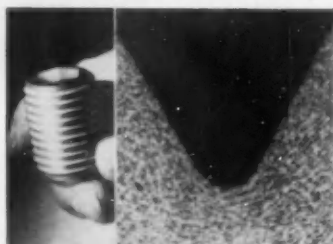
Circle 27 on postcard for more data

### Hose

High pressure hose, designed specifically for the hydraulic equipment industry, is being placed on the market. Called Flexsteel hydraulic control hose, the product is wire-reinforced and is available in sizes from 3/16 in. to two in. inside diameter. Depending on size, the hose handles pressures ranging up to 5500 psi. *Industrial Products Div., Goodyear Tire & Rubber Co.*

Circle 28 on postcard for more data

### Tough Set Screws



Unbrako socket-head set screws can be tightened up to 40 per cent tighter than ordinary set screws, according to the maker. Claims made include greater holding power, more uniform fit, and better wear life. These are based on fully formed threads (flow lines illustrated on right), deeper sockets, fillets, harder socket walls, and self-locking cup point. *Standard Pressed Steel Co.*

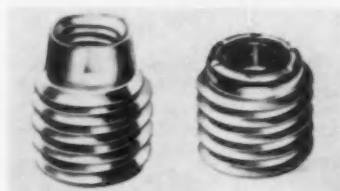
Circle 29 on postcard for more data

### Self-Locking Bushing

A self-locking, vibration proof bushing has been designed for use in rela-

tively soft castings, forgings and extrusions such as aluminum alloy, magnesium, mild steel and some plastics.

Type 2424 bushings are available in two internally self-locking designs for temperatures up to 250 F, right, and up to 550 F, left. Both are said to provide complete locking torque protection and excellent re-use character-



istics as required in AN-N-5b and AN-N-10a respectively. Minimum ultimate load is 140,000 psi. *Elastic Stop Nut Corp. of America.*

Circle 30 on postcard for more data

### Blower

A compact blower is said to be suitable for a wide range of industrial and aircraft applications. The model 100 blower uses a five-in. diameter rotor to obtain high pressure rise through speeds as high as 38,000 rpm. The rotor delivers approximately 65 in. of water static head rise at sea level with a static efficiency of better (Turn to page 98, please)



# Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

## FREE LITERATURE

### Cold Finished Steel 1

A 32-page dictionary of steel terms of particular value to men who buy or use cold finished steel bars includes more than 180 relatively detailed definitions. Bulletin No. 6. *LaSalle Steel Co.*

### Coolant Filters 2

A four-page bulletin just announced describes Delpark coolant filters available for four major models of the Thompson Grinder line. *Industrial Filtration Co.*

### Valves 3

Solenoid valves designed for use with liquids, gases or refrigerants can be used for stop and start operations, mixing and blending, metering or measuring, controlling pressure differential, pressure, temperature and flow. Information on proper selection, features, coil construction, lift ratings, coil frequencies and liquid capacity and typical applications are listed in Form RS141, section C. *A-P Controls Corp.*

### Machine Components 4

A 20-page brochure covering its line of standardized machine components including hydraulic drill units, automatic cam feed drilling units, lead screw tapping units, multiple spindle heads, automatic index tables and machine bases is now available from *The Hartford Special Machinery Co.*

### Grinding Wheels 5

A method of selecting grinding wheels for tool steels is the lead article in *Grits and Grinds*, Vol. 46, No. 5. *Norton Co.*

### Colloidal Graphite 6

Bulletin 435 describes how electric-furnace graphite of high purity, when processed to colloidal size and dispersed in a suitable carrier, is used effectively as a surface coating for many mechanical devices. *Acheson Colloids Co.*

### Speed Governor 7

A complete line of speed sensitive switch governors uses the same governor flyweight principle as do the firm's overspeed governors. Bulletin 504S gives data on a number of models and drives. *Synchro-Start Products, Inc.*

### Gear Facilities 8

To demonstrate ability to mass produce gears for high-precision applications, as well as regular industrial uses, a 24-page booklet catalogs the production facilities in the company's plants. *Footo Bros. Gear and Machine Corp.*

### Valve Subplate 9

Complete engineering data and specifications on the Hupp threadless subplate for gasket-mounted hydraulic valves, has just been released in bulletin H55 by *Petch Manufacturing Co.*

8/1/55

VOID After Oct. 1, 1955

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## Speed Drive

The general-purpose, full-wave, Thy-mo-trol adjustable-speed drive is illustrated in eight-page publication GEA-6234. It emphasizes the unit's printed control circuits. *General Electric Co.*

## Steel Tubing

SAE hydraulic quality low carbon steel tubing specifications and data are set forth in bulletin 39, including comparison of four specifications which have been used for pressure applications: SAE, JIC, AMS 5050 E, and ASTM-A-179. *Superior Tube Co.*

## Damping Devices

History, design, construction and operation of damping devices are reviewed in a brochure offered by *Gabriel Co.*

## Air Filters

Poros-Stone filters for compressed air and gases are illustrated in bulletin 117 which covers the operation of the TR filter, in which the movement of the compressed gas is used to achieve initial separation. Second stage separation is by diffusion through a permanent element which is unaffected by oil or moisture. *R. P. Adams Co.*

## Tube-Flarer

Descriptive details on the model 232B power tube-flarer, including operating instructions for 37 deg or AN flaring, squaring and burring, and beading of tubing, are offered in newly published Catalog 1145A12. *Tube & Hose Div., Parker Appliance Co.*

## Aluminum Tube

A low-cost method for making aluminum tube directly from strip is claimed to greatly extend the field of application of aluminum tube, in diameters from 1/2 to 2 1/4 in. and wall thicknesses from 0.020 to 0.083 in. Technical Advisor No. 29, *Reynolds Metals Co.*

## Quenching Oil

Quenching Oil Light is described in technical bulletin No. 37. Included is a table showing the advantages of various degrees of oil agitation. *Sun Oil Co.*

## Fabricates Aluminum

"Service To Industry," a 24-page summary of facilities and services offered by the Contract Div., shows five large factories and rolling mill with a total area of over 1.6 million sq ft. *Aluminum Goods Manufacturing Co.*

## Tooling Products

A 38-page brochure covers such subjects as custom, standard and special purpose lamination dies; various phases of tungsten carbide fabrication; compacting dies for metal and ceramic operations; jigs and fixtures; precision gages; and other equipment plus the engineering and service available. *Cleveland Tool and Die Co.*

## Titanium

Machining recommendations for titanium and titanium alloys based on basic data accumulated through fabrication experience and research studies are given in an eight-page bulletin offered by *The Mallory-Sharon Titanium Corp.*

## Air, Oil Valves

Bulletin 155, 34 pages, describes and illustrates the company's standard line of valves for pneumatic and hydraulic use, as well as special components for aircraft and general industrial use, including hydraulic and pneumatic actuators, spring and air-loaded accumulators, lock valves, flap synchronizing valves, master brake control units, canopy actuators and steering controls, etc. *Aircraft Products Co.*

## Exhaust Systems

A 12-page manual contains instructions for installing Monoxivent exhaust eliminating systems. *Keat-Moore Organization, Inc.*

## A I Index

Check 22 for an index to Vol. 112 (Jan. 1 to June 15, 1955) of *AUTOMOTIVE INDUSTRIES*.

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VOID After Oct. 1, 1955

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For proof of increased production at lower cost, try a partial run with Aristoloy Leaded Steel.



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# Observations

By Joseph Geschelin

## Gets Most

Carboly's Machinability Computer, announced recently, should be a boon to everyone concerned with machining metals. Of analog type, it is capable of digesting many of the more important variables involved in the complex function. It dispenses with the juggling of mathematical equations, requires only an intimate working knowledge of tools and the metal cutting process. When used by an expert in these things, it will point quickly to the maximum utilization of tools and machines, will make it possible to get the most out of a given machine tool. Process development departments, tool engineers, and machine tool builders will find the device invaluable in getting estimates quickly.

## Lapped Surfaces

Surface lapping machines have found an important niche in automotive plants for the lapping of valve bodies, transmission cases, and other parts of automatic transmissions. Now we hear that big equipment for this purpose is being considered experimentally for lapping cylinder head and cylinder block bank faces. In fact, one expert thinks that as compression ratios of V-8 engines are increased still further, lapping may become imperative on these surfaces in the interest of exercising better control over the tiny compression volume that results.

## Tool Wear

Experience on an individual basis is the only reliable criterion of tool life in a highly mechanized machine. One of the major transfer machine builders recently marked another important step in reducing tool changes while maintaining close dimensional control. We refer to a mechanism for sensing tool wear and automatically adjusting the tool slide to maintain standard cutting conditions. It is really a tremendous step forward.

## Transfer Machines

In the past we have noted many examples of transfer lines that are fitted with automatic inspection stations of various kinds. Recently we saw a transfer line under construction which also includes automatic reject stations. If the work is rejected at a given inspection station, it is automatically shifted off the line onto a spur conveyor.

## Connotes Progress

According to a prominent builder of transfer equipment, the next phase in development of such equipment is the addition of minor assembly operations together with the introduction of special process equipment. One such arrangement features seam welding, spot welding, and induction hardening on a line that also performs numerous drilling, tapping, and facing stages.

## Current Projects

Quick look around the machine tool industry shows that many companies are feverishly engaged in completing transfer machines and special machines for some major 1956 tooling projects. What makes things tough for individual companies is that they also have the problem of preparing special equipment for display at the Machine Tool Show in September. All deadlines come about the same time.

## More Reliable

It is doubtless true that no one can guarantee absolute reliability of modern transfer equipment. Even a little connection that goes wrong can tie up a line. One should find a lot of comfort, therefore, in the Electro-Graphic Detector panel recently exploited by W. F. & John Barnes. In miniature form, these panels show every connection in the complex electrical system of a transfer machine,

making it a simple matter to locate a fault in the system in a matter of minutes. Maintenance is simplified immeasurably and the risk of shutting down equipment reduced to the minimum.

## Automatic Loading

We have it on good authority that automatic loading and unloading of hobbing machines for automotive use is a reality and should be seen in plants in the near future. When you combine automatic handling with an automatic shift mechanism—as in the case of Barber-Colman—you are approaching ideal operating conditions.

## Tool Setting

Two distinct methods of managing tool changes on transfer machines are currently in vogue. In one case, a Toolometer or some other device may be employed to shut down a station or a section of the machine line when tool change is indicated. The other method is to supply a system of warning lights. In this case the machine keeps running and it is up to the tool setter to decide whether to change now or later. Machine tool builders and users alike are seeking the best means of managing tool life without shutting down an expensive piece of equipment.

## Machine Design

In planning the design of a new transfer machine both the designer and user now have a choice of some basically different methods of moving work from station to station. One way is to move the work by a transfer mechanism; another is to position work step-by-step, using a rise-and-fall mechanism; and the third is by means of the pallet type conveyor in which the work is held in a special fixture for the entire cycle. The latter method results in a more expensive installation but is essential in many special cases. At least there is a choice for judicious action.



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## A NEW LINE OF GISHOLT MACHINES

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The new Gisholt MASTERLINE medallion identifies this new and improved series of machines—and re-emphasizes Gisholt achievements in building the master tools of industry since 1887.



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Be sure to visit the Gisholt exhibit—Booth 1413, Exhibition Hall.

# GISHOLT

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# METALS

*Increase in Price of Aluminum Expected. Cost of Zinc Increased to 12½ Cents per Lb. Tin in Better Demand.*

By W. F. Boericke

## Steel Industry Recovering From Short-Lived Strike

The short-lived steel strike actually set deliveries back a week or 10 days for some products. Probably 600,000 tons were lost because of the 12-hour shut-down. That's not all. Even a short shut-down hurts furnace linings and means heavier maintenance repairs, with furnaces out of production earlier than expected. It will take more time to get the industry back to the high operating rate of 97.5 percent of capacity attained in June.

Producers see little relief ahead from the terrific pressure put on them for more steel. There's little prospect of less consumer demand. The automobile industry is as insistent as ever. It's expected that manufacturers will start soon to build up stocks for 1956 models. The railroads have come in the market since June for 45,000 new cars, which *Iron Age* estimates will require 1,200,000 tons of finished steel and castings, mostly plates, structurals, and bars—all in tight supply. The same authority observes that probably consumers will face another cut in their steel rations for the third quarter, with mills obliged to set aside at least 30 days production to bring deliveries into line with promises. Most mills are booked heavily for tin-plate.

## Price Increases Fail To Halt Steel Demand

Consumers generally are taking the average price increase of \$7.50 per ton, or 5.8 percent increase in base steel prices without visible protest. The increase, however, which followed the 15 cent per hour wage hike was higher than expected. It scrapped the old 40 for 1 ratio, which would have called for a \$6 per ton price rise for steel. Few cancellations followed U. S. Steel's announcement, which set a general pattern for the industry. This is pretty plain proof that inventories were not excessive and had not been built up before the strike.

Producers estimate the wage increase will cost the industry \$450 millions overall. The higher-than-expected prices set for steel products may allow as well for higher coal costs that are probable if demands for wage increases are made by the United

Mine Workers, whose members work in the captive coal mines of the steel companies.

## Prices Advance in Pig Iron and Scrap

It was entirely expected that pig iron prices would be advanced following the steel settlement. They were boosted \$2½ a ton to \$61. Demand for castings remains very heavy. An increase in iron ore prices will probably not be long delayed.

The scrap market jumped sensationally in mid-July, as much as \$5 per ton in some areas. In Pittsburgh No. 1 scrap went to \$40. Slowdowns at the blast furnaces, with effort to bring up the operating rate to the June level, have put a premium on scrap, which was rising even before the strike. The Commerce Department announced that present Federal curbs on exports of iron and steel scrap will continue unchanged in the third quarter.

## Copper Shortage Acute

By mid-July the copper shortage had become desperate. One of the largest manufacturers of copper cable had been obliged to suspend production at all of its plants because of inability to obtain the metal. Strikes at mines and smelters of three principal producers had cut domestic production to 45,000 tons per month, down about 60 percent of normal. About 35,000 tons had been lost to industry during the two weeks of idleness.

However, it was felt that the strike would not continue indefinitely. American Metal Co. had settled with its union, and Anaconda miners had voted not to strike. American Brass workers accepted a company settlement. At least part of the Phelps-Dodge men stayed on the job. Only at Kennecott, largest domestic producer, was the shut-down complete.

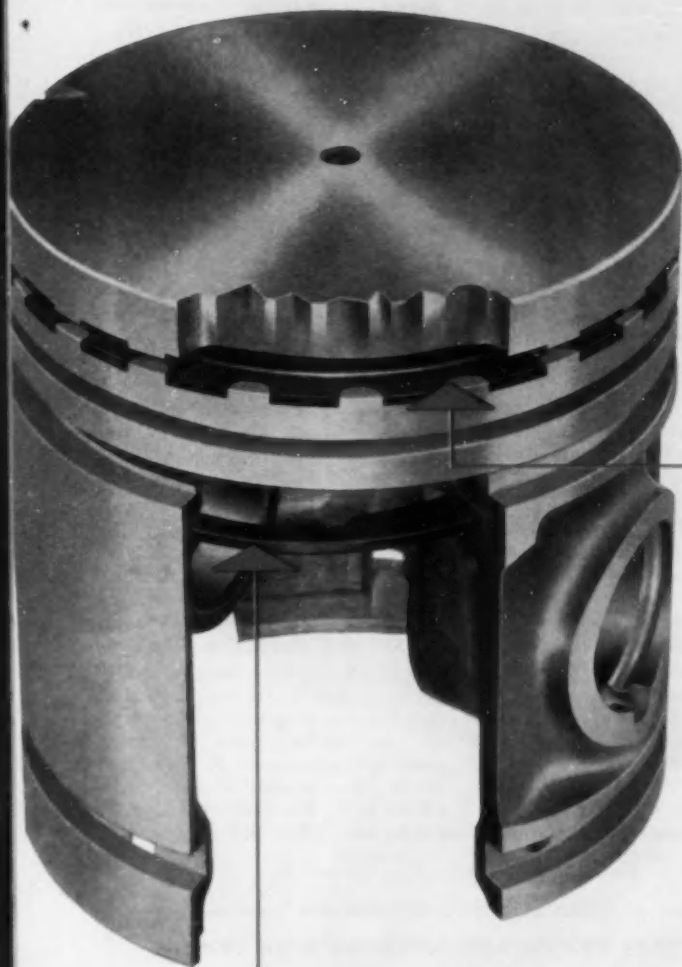
The full impact of the work stoppage will not be felt until later months, because of the 60-90 day lag in converting blister copper into electrolytic. This virtually insures a tight copper market for the rest of the year, and any hope of an easier copper price has gone out of the window.

The only semi-cheerful note is that the strike was called when the copper fabricators in the Connecticut Valley are normally shut down for the usual two-week vacation period. Appeals have been made to Washington to restore allocations of copper being shipped to the stockpile, and that copper producers

*(Turn to page 104, please)*

# NOW!

## STERLING CONFORMATIC PISTONS



**CONFORMATIC STEEL CONTROL MEMBER**, anchored at the pin bosses only, controls skirt clearance . . . hot or cold! The metered steel insert allows you to specify the piston clearance you want for your engine. (Clearances from zero to  $\frac{1}{2}$  thousandth inch are generally recommended.)

are  
available with  
**LOW COST**

## Intra-Cast<sup>\*</sup> STEEL-LINED GROOVES

**Steel protection—top and bottom—gives sensationally longer life to rings and grooves.**

This ring is *integrally cast* into the piston . . . positioned so that when the grooves are machined, the top ring groove is *lined with steel* and has islands of aluminum for ring cooling. This Intra-Cast steel-protected groove resists enlargement and materially reduces top ring land wear and rounding. And, it does it at far less cost than other methods.

<sup>\*</sup> Tradename Registered

**STERLING ALUMINUM PRODUCTS INC.**

ST. LOUIS, MISSOURI

# News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

## Ternstedt To Boost Capacity 75 Per Cent at Columbus, O.

When it completes its expansion program at Columbus, O., Ternstedt Div. of General Motors Corp. will increase production capacity at that plant by 75 per cent. The multi-million dollar program will include addition of more than 625,000 sq ft of manufacturing space and a completely new waste disposal plant.

## GM Research Wind Tunnel Unit Supplants Many Outdoor Tests

Said to be the latest and most modern of its kind built exclusively for full-size vehicle tests, the new wind tunnel at the GM Technical Center is designed to generate an airstream ranging from 25 to 125 mph.

The facility is available to GM engineers for studying effects of air velocity, temperature and, to a small extent, direction on the operation of automobiles and medium-size trucks and automotive components.

Such items as heating, cooling, ventilation, or air conditioning units can be put through controlled performance tests in the tunnel. Also, engineers can observe effects of changing air temperatures and airstream speed

in tests of body tightness, body noises, and car stability.

The wind tunnel is contained in a rectangular building with concrete walls 12 to 14 in. thick. Vertical ribs supporting the walls are on the outside so that wind flow along the inside walls is uninterrupted. In each corner of the building is a large series of curved vanes to change the airstream course with as little turbulence as possible.

Wind is supplied by two three-bladed aircraft propellers 13½ ft in diameter, manufactured by Allison Division's Aeroproducts Operations. The propellers are driven by 400-hp electric motors that have a constant speed of 900 rpm. Propeller blades are variable pitch to regulate closely the airstream velocity.

Temperatures can be controlled from a minimum of 60 deg to a maximum of approximately 150 deg, and rain can be simulated from overhead spray nozzles. It is possible to produce a deluge up to 100 gal a minute in an area of 525 sq ft.

The wind tunnel tapers down to a width of 15 ft and a height of 10 ft in a test area or section 35 ft long. This constricts the air and causes its velocity to increase through the area where an automobile or truck is on test. In the test section is a 200-hp chassis dynamometer for measuring a test car's power output.

## Diesel - Mechanical Locomotive Built for Army Use by B-L-H

Ready for military service is a new Diesel-mechanical locomotive. It was built to Army specifications for Transportation Corps operation in this country and abroad.

Weighing 48 tons and driven by a Caterpillar D-397 engine, this unit uses a torque converter to send engine power direct to the wheels. Its builder, the Baldwin-Lima-Hamilton Corp., points out that the same principle will be incorporated in locomotives it is producing for two Eastern railroads planning to put lightweight trains into service.

Advantages of this form of transmission, says the Army, include reduced needs for critical material and spare parts, simplified maintenance, and lower weight for the complete locomotive. The unit is designed to be run in all types of climate in both switching and over-the-road service.

## McCord Corp. Schedules \$750,000 Expansion Plan

Two McCord Corp. branch plants will be included in the company's latest expansion program totaling \$750,000. At the Washington, Ind., unit, space will be increased by about 40,000 sq ft to a total of more than 105,000 sq ft. The Wauseon, O., plant will be doubled to 70,000 sq ft, under the program.

## EVERY SECTION OF NATION SHOWS SIZABLE PERCENTAGE INCREASES OVER 1954

### Regional Sales of New Passenger Cars

Zone	Region	Five Months				Per Cent Change			
		May 1955	April 1955	May 1954	1955	1954	May over April	May over May 1954	Five Months 1955 over 1954
1	New England	40,189	42,960	37,033	168,082	136,617	- 8.57	+ 8.62	+21.85
2	Middle Atlantic	121,825	136,383	96,901	548,079	431,189	-16.67	+25.72	+27.11
3	South Atlantic	76,463	73,124	64,846	300,067	261,945	+ 7.30	+21.00	+33.65
4	East North Central	169,145	169,089	121,747	734,268	660,538	- 27	+30.93	+29.16
5	East South Central	29,533	29,742	26,757	137,948	111,116	- 7.90	+16.37	+24.16
6	West North Central	61,071	61,060	56,944	256,239	222,079	+19.39	+18.40	+12.30
7	West South Central	66,630	66,351	49,021	237,035	207,094	+ 9.65	+22.70	+14.68
8	Mountain	21,756	20,926	19,280	88,993	65,256	+ 3.97	+42.35	+31.08
9	Pacific	77,084	72,300	53,216	329,304	273,999	+ 7.72	+46.35	+53.92
	Location Not Determinable			113		880			
Total—United States		661,394	661,056	520,958	2,949,532	2,220,061	+ 1.45	+26.04	+27.95

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt.; Zone 2—N. J., N. Y., Pa.; Zone 3—Del., D. C., Fla., Ga., Md., N. C., S. C.; Va., W. Va.; Zone 4—Ill., Ind., Mich., Ohio, Wis.; Zone 5—Ala., Ky., Miss., Tenn.; Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D.; Zone 7—Ark., La., Okla., Tex.; Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.; Zone 9—Cal., Ore., Wash.

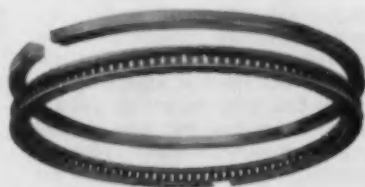
Of the 4,132,604 passenger cars produced from Jan. 1 to May 14, 1955...almost half\* were equipped with the **NEW**



U. S. Patents 2,635,022  
and 2,699,829

- Uniform pressure on entire circumference!
- Multiple tiny springs exert both side and radial pressure!
- Provides maximum oil drainage!
- Universal application...bottomless and conventional grooves...oil depths.

**Better than any other oil ring for  
new high-compression, high-vacuum  
overhead valve engines!**



\*44.7% were Type 98 Chrome Oil Ring...55.8%  
all other oil ring types combined, including other  
Perfect Circle oil ring types.

**Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., Toronto, Ontario**

## NEW PRODUCTS CONTINUED FROM PAGE 88

than 75 per cent. The blower supplies 22 lb of air per minute at a static head rise of 20 in. at 20,000 ft altitude pressure and inlet temperature of 200 F.

A special bearing makes the blower suitable for use under severe high temperatures. Bronze-steel ball retainers are used for resistance to high temperatures. *Propulsion Research Corp.*

Circle 31 on postcard for more data

### Governors

The "300" series governor offers three weight systems used interchangeably in the same governor body. The GC-5300 cam nose weight



system, right, gives five to ten per cent regulation and is ideally suited for farm tractors, combines and similar applications where low cost and long wear is important. The GC-3300 laminated weight system, left, is for precision governing where three per cent or better regulation is required. Levers for both constant speed and long range models may be mounted on either the right or left side. A broken throttle lever for simplified idling is available on all installations. *Pierce Governor Co.*

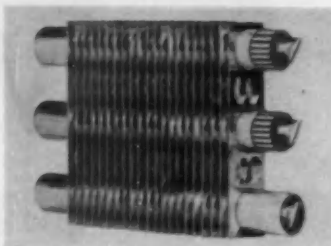
Circle 32 on postcard for more data

### Temporary Holder

A new item called Vellubolts is said to simplify the unwieldy and time consuming process of assembling the oil pan and gasket to the crank case, in the replacement industry. These tapered precision-made bolts are screwed into the four corners of the engine bed, then the gasket and the oil pan are snapped over them and held in position while the regular bolts are inserted. They are taken out for use over and over again. *Vellumoid Co.*

Circle 33 on postcard for more data

### Novel Exchanger



Application of the Inner-Fin heat transfer surface to a wide range of aviation heat exchangers includes air-to-air, liquid-to-air and liquid-to-liquid exchangers of all-aluminum and stainless steel construction. The construction provides longitudinal fins inside a tube in conjunction with standard outer fins. A small inner tube is mechanically expanded, locking the longitudinal Inner-Fins in close contact with the inner wall of the outside tube. Greater surface area and smaller hydraulic radius are designed to permit more rapid heat transfer. *Bush Manufacturing Co.*

Circle 34 on postcard for more data

### Primer

A hot fuel priming device is said to make three-minute starts a reality for large aircraft piston engines in Arctic temperatures.

The unit, built to conform with military specifications, enables the pilot to have an engine firing within 60 seconds, even after a 72-hr "cold soak" at -65 F by continuously delivering 200 F gasoline to the cylinders. In another two minutes, the engine is running "free and clear"; the unit can be installed as a package in the fuel line of any piston-type engine, between the carburetor and the cylinders and in series with the standard engine primer. It is controlled by a double-throw switch in the cockpit, and can be operated intermittently or continuously, as required. *Janitrol Aircraft-Automotive Div., Surface Combustion Corp.*

Circle 35 on postcard for more data

### Aircraft Wire

General purpose wire of a new type will operate satisfactorily at temperatures ranging from -80 to 400 F. Other features of the new wire are: resistance to solvents; adaptability to ordinary surface marking machines; flexibility, even at extremely

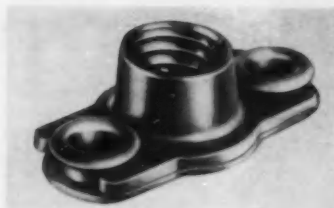
low temperatures; resistance to fungi; and smokelessness.

A copper conductor which is silver plated so that terminal connections can be welded, silver soldered or soldered conventionally. An extrusion of silicone rubber covers the conductor followed by a barrier braid of glass fiber. A braided protective outer covering of synthetic heat- and abrasion-resistant yarns is impregnated with heat- and solvent-resistant high temperature lacquer. Type 350 high temperature aircraft wire is approved to government specification MIL-W-8777. *Electric Auto-Lite Co., Wire & Cable Div.*

Circle 36 on postcard for more data

### Anchor Nut

A precision full floating miniature anchor nut was introduced recently, said to be less than one-half the size



of conventional floating anchor nuts. The receptacle design now allows the floating anchor nut to be interchanged with fixed miniature anchor nuts. It has the same rivet size and the same rivet hole spacing. The new nut weighs one-third the weight of a conventional floating anchor nut. Recent tests show that the torque-out and push-out strengths are far in excess of AN specifications. *Kaynar Co., Kaylock Div.*

Circle 37 on postcard for more data

### Insulation

So-called "ceramoplastic" electrical insulation material that reportedly can withstand the effects of radiation and 1000F temperatures without losing its properties has been developed. Supramica consists of pulverized synthetic mica bonded with high-grade electrical glass. Other features include total and permanent dimensional stability, low electrical loss, and unequalled arc resistance. The material is now available in sheet and rod now available in sheet and rod form or as finished components precision-molded to desired specifications. *Mycalex Corp. of America.*

Circle 38 on postcard for more data

# New Lantuck-NR

## makes

# headlining news in the '55 Dodge



New Dodge Custom Royal Lancer V-8 features headlining, bolsters and door panels backed by Lantuck.

The beauty of the Dodge's new interior styling is no longer news. But the fabric backing the headlining is news—important news for the industry.

It's one

of the first uses of a completely new Lantuck backing fabric called Lantuck-NR. Designed from the start to reinforce vinyl film or coating, its random distribution of nylon and rayon fibers are bonded with a special agent for really remarkable strength and elasticity.

Lantuck-NR gives vinyl: 1. high tear strength; 2. outstanding stretch and recovery; 3. easier, neater tailoring; smooth, even surface—no clothiness; 4. good embossing surface; 5. durability and economy; 6. equal tensile strength, tear and stretch characteristics in all directions.

This Lantuck-NR backed vinyl headlining was supplied by Textileather Division of General Tire and Rubber Co., under its own trade name, Nygen Tolex.

But that's not all. There's more to this interior story. Vinyl-quilted Lantuck was used in the bolsters and door panels of this new Dodge and was supplied by National Automotive Fibres, Inc.

Our nearest sales office has full details on new Lantuck-NR as well as any other Lantuck fabric for automotive use.

## Wellington Sears

A Subsidiary of West Point Manufacturing Company

### FIRST In Fabrics For Industry

\*LANTUCK: Registered trademark of West Point Mfg. Co. for its non-woven fabrics.

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AUTOMOTIVE INDUSTRIES, August 1, 1955



Each year, a typical aircraft manufacturer receives and ships 147,352 million lb of products and materials. It takes 1164 freight cars and 14,940 trucks, not counting airliners and ships, to handle the traffic.

Design of a modern heavy bomber took about eight million hours. That's equal to a team of 15 engineers working eight hours a day, every day of every year from 1776 to 1954.

Taxes now amount to four and a half times as much per person as before World War II. Government charges came to \$572 per person in fiscal 1954. The tax load in 1941 was \$129 per person.

In 1920, about 10,000 persons were engaged in research totaling \$29 million. Today, some 350,000 people are working in research, and the annual outlay has soared to \$4 billion.

A modern supertanker can carry enough aviation gasoline to fly a Stratocruiser around the world 301 times.

It is expected that 60 to 65 per cent of all cars sold in 1955—new and used—will be financed.

Since the year 1899, 18.3 per cent of all patents issued in the U. S. have been in the automotive field. In 1953 alone, 7748 automotive patents were issued.

Some 70 million U. S. citizens—one third of them women—are now licensed to drive automobiles. Last year they piled up a total of 550 billion vehicle-miles.

Today's car has 20 per cent to 25 per cent more glass than its 1949 counterpart.



Heints Manufacturing Co.—Charles B. Grace has been advanced to president, and William J. Meinel has become chairman of the board.

Wellman Bronze & Aluminum Co.—Glenn F. Ihrig has been promoted to general sales manager.



Chevrolet Motor Div., General Motors Corp.—Robert Schilling has been appointed director of research and development for the Engineering Dept.

Electric Auto-Lite Co. — W. E. Blank was elected vice-president in charge of replacement sales.

Rolls-Royce of Canada, Ltd.—A. G. Morrall has been appointed assistant to the general manager; C. Raymond Russell, sales manager of the Motor Car Div.; and Jack Osborne, motor car service manager.

## MEN in the NEWS

(Continued from page 41)

Eaton Mfg. Co., Axle Div.—John R. Bartholomew has been appointed chief engineer.

U. S. Rubber Co., Mechanical Goods Div.—Herbert J. Reid is now assistant general manager.

Continental-Diamond Fibre Div. of the Budd Co., Inc.—Harry K. Collins has been named vice-president and general manager; J. Franklin Anderson and Ernest O. Hausmann, vice-presidents; W. H. Walker, purchasing manager; A. H. Haroldson, research and development manager; H. M. Dexter, general sales manager; J. Paul Jacquette, assistant secretary and assistant treasurer; Worth Tracy, employee relations manager; Martin J. Gauger, assistant controller, and L. K. Winter, export sales manager.

General Electric Co.—Chester H. Lang has retired as vice-president of public relations.

Chrysler Corp.—J. C. Poyner is now assistant general purchasing agent in charge of raw materials.

Pennsylvania Salt Mfg. Co., Chemical Specialties Div.—J. Stanley Hall was made sales director.

Studebaker-Packard Corp.—Dana M. Norton was named director of industrial relations for Detroit-area operations, and Peter S. Barno was chosen director of industrial relations for Studebaker plants in South Bend, Ind.

National Automatic Tool Co., Inc.—Ralph Cox was named Buffalo regional manager, and Lou Maef was chosen supervisor of West Coast dealer activities.

Goodyear Tire & Rubber Co.—George F. Clayton has been named assistant secretary.

## AUTOMATION News Report

(Continued from page 69)

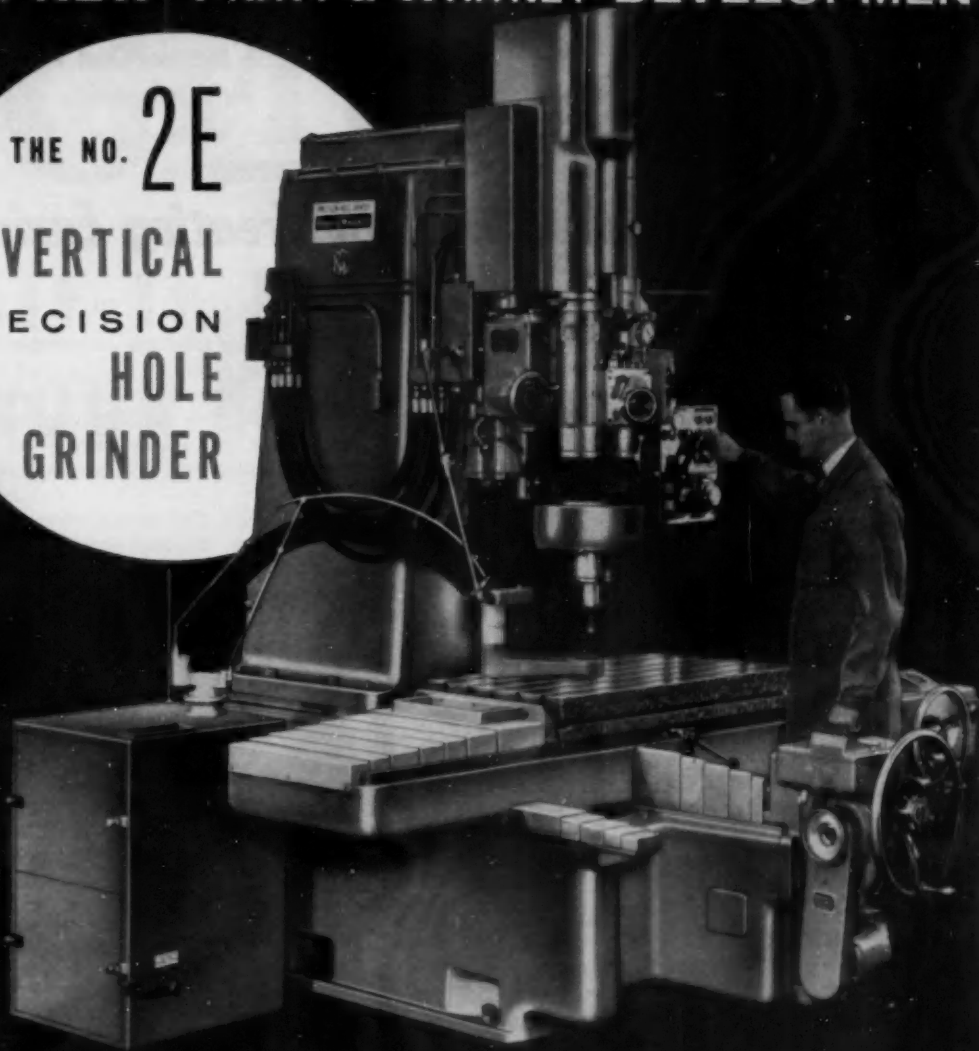
such production machines as one which assembles electronic components. These highly automatic machines will cut costs enough to bring printed circuits, transistors, and other new techniques into the picture more and more, both for controlling metalworking machinery and for use on the consumer product.

### CONTROL IN JOB SHOP

Production control with electronic data processing equipment often is felt to be too costly for smaller companies. A study was made of possible savings in medium-size and smaller firms, those that make a variety of parts in small lots such as do suppliers to the aircraft industry. The report states that this equipment is useful for plants with over 1000 employees, and marginal for those with 500 to 1000. "Freedom of choice" of the foreman is a major criteria—the more he has, the more useful data processing will be. The report, prepared for the Navy by R. G. Canning of UCLA, is for sale by the Dept. of Commerce, Office of Technical Services, Washington, D. C., for \$1.50 (PB 111580). The author studied 20 plants in the Los Angeles area and made detailed recommendations for one plant. Material is presented in the language of users of this equipment, rather than in technical jargon.

Another NEW PRATT & WHITNEY DEVELOPMENT

THE NO. 2E  
VERTICAL  
PRECISION  
HOLE  
GRINDER



- **EXTREMELY ACCURATE** . . . Incorporates the famous P & W Electrolimit Measuring System. Table settings accurate to .0001". Grinds straight or tapered holes and radii with extreme accuracy.
- **HIGH GRINDING SPEEDS** . . . Pneumatic grinding heads, of unique air bearing design, provide speeds from 4,000 to 100,000 rpm. Governor effectively maintains speed settings regardless of load changes.
- **FAST, SIMPLE, ECONOMICAL OPERATION** . . . Unlike conventional bore grinders, the 2E holds work stationary; grinding head has planetary motion around axis of hole. This — com-

bined with fast, accurate table locating system — permits grinding holes of various sizes in a workpiece to close tolerances for size and location in a single setup. Controls for all machine motions within easy reach of operator. Time and costs are minimized.

- **VERSATILE** . . . Grinds holes up to 10" dia. Big table (22" x 44") with P&W open-side construction easily accommodates large or odd-shaped work. By adding a P&W Precision Rotary Table, any simple or compound angle can be located and ground without special fixtures.
- **DURABLE-DEPENDABLE** . . . All slide ways are protected by telescoping guards. Entire machine is designed and built to minimize wear and to retain its original high accuracy and rigidity year after year.

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. . . See the 2E in operation at Space 1219



FIRST CHOICE FOR ACCURACY  
SINCE



MACHINE TOOLS • CUTTING TOOLS • GAGES  
1860

By W. J. Behrens, Chief Metallurgist  
Marion Manufacturing Div.  
Dana Corp

# AUTOMATION

## Applied to Heat Treating Equipment

**M**ODERN continuous heat treat furnaces, due to their ability to accommodate all types of parts of different shapes and sizes, and a large variety of methods of material movement, have literally moved from the conventional heat treat department and has been placed right in the production lines. One of the newest automotive parts plants, the Marion Manufacturing Div. of Dana Corp., is a good example of this trend. All basic parts production for automotive universal joints and propeller shaft assemblies is carried out on an automated basis with each individual part having its own manufacturing line. Where heat

treatments of any kind are involved, except for the treatment of "as received" forgings and for tool room operations, the furnaces are incorporated in the production line. In this manner, gas-fired, continuous furnaces of the belt, pusher tray, rotary retort, overhead pusher, and barrel type are used in automation applications.

Heat treatments such as annealing, hardening and drawing, required for forgings in the "as received" condition, are carried out in one area near the receiving docks. A pusher type cycle annealer and several

(Turn to page 106, please)

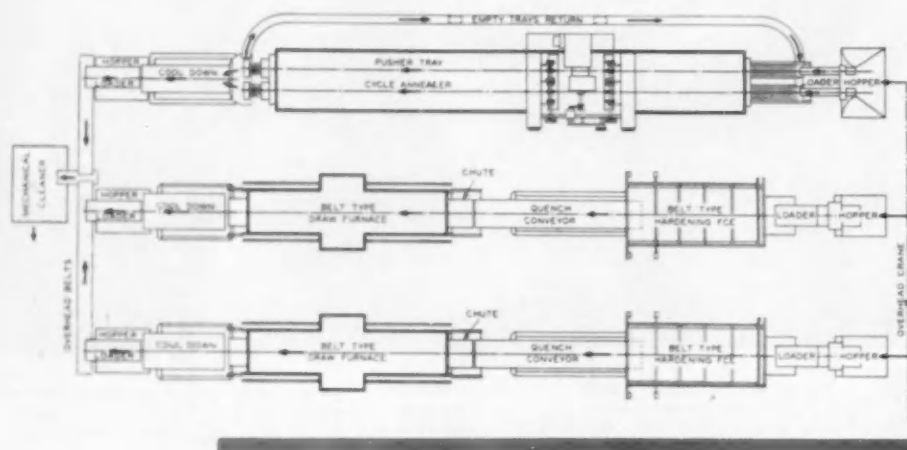


FIG. 1

Floor plan of "as received" forging heat treat area shows the cycle annealer and draws and hardens and draws all automatically tied into a mechanical cleaning operation.

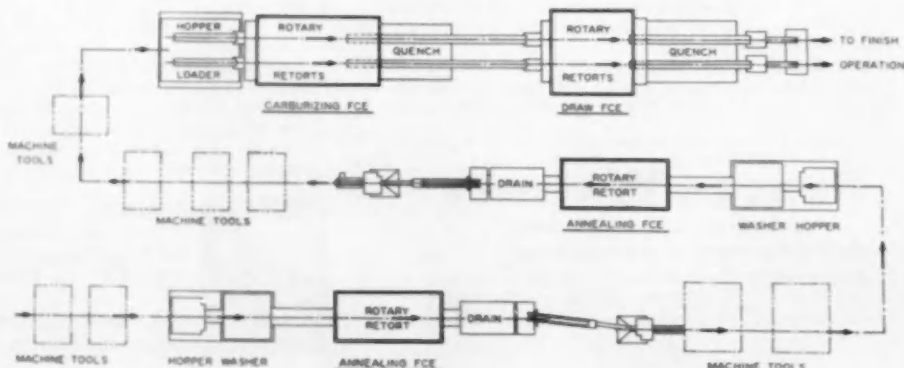


FIG. 2

Schematic flow of the automatic production line for bearing races. It integrates press forming, machining, deep drawing, annealing, washing, carburizing, and grinding operations.

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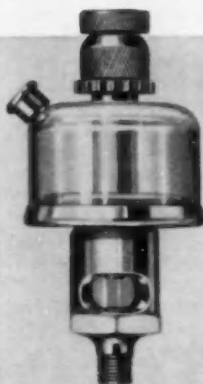
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**OIL  
CUPS**

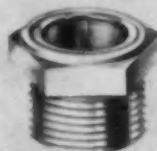
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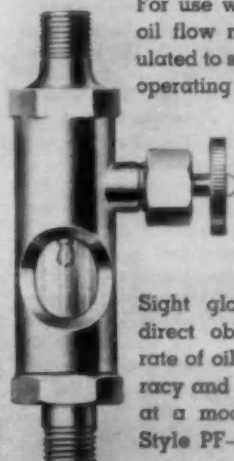
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# METALS

(Continued from page 94)

be relieved of their contracts to make such shipments. It appears questionable if the Government will grant such relief, as union quarters would be quick to raise the cry of strike-breaking.

## Wide Difference in Official And Open Market Price

While the copper price is still held officially to 36 cents per lb. in the outside market it can't be obtained for less than 44 cents, if at all. On the London Metal Exchange, copper as quoted about 43 cents, in spite of the gallant efforts of the Prain group to hold their price to 35 cents, on a day-to-day basis.

The big producers appear still unalterably opposed to raising the price. Their contention, aside from their belief that a higher price for copper would be detrimental to their own interests, is that it would not bring out another pound of copper from hiding. Furthermore, why ask a higher price for something that can't be offered for sale?

June figures of the Copper Institute showed 132,842 tons of electrolytic metal delivered to users, largest for the year and refined stocks on hand at the month's end down to 38,533 tons, only a week's supply.

## Zinc Price Raised

Late in June the zinc price was raised ½ cent to 12½ cents per lb. The advance was entirely expected because of the continued heavy demand from the diecasters and the quick ending of the steel strike, which insured good business from the galvanizers. Strikes thus far have not affected zinc mining and smelting.

The June figures of the Zinc Institute showed domestic shipments during the month were at an all-time high of 90,915 tons. Only 6632 tons were taken by the Government for the stockpile. At the end of the month stocks had fallen to 48,612 tons. Within 13 months' time they have been reduced nearly 80 per cent from 209,828 tons.

Feeling is general that the zinc price will be advanced another ½ cent to 13 cents per lb, in keeping

with the higher price of steel, but an immediate upturn is not expected.

## Lead Output Cut by Strikes

Lead remains firm at 15 cents per lb. Demand is good while supply has been hurt by shutdown of the American Smelting Plants because of the strike. Losses of lead in consequence are estimated about 10,000 tons to mid-July. Shipments of replacement batteries amounted to 1,751,000 units in May, substantially more than reported for the same month in 1953-54.

## Tin Slightly Improved

Tin, long neglected price-wise among the metals, appears to be in somewhat better demand with the market edging upward to 96½ cents per lb. It appears likely that the International Tin Agreement, more popularly known as the Tin Cartel, will shortly become effective. But there is little reason to think that in such event the tin price will show any marked change up or down. The announced purpose is to permit a more orderly marketing of tin with some control on production with full approval of the signatory governments. Tin consumption neither in U. S. or U. K. has followed the trend of industrial activity and is substantially lower now than pre-war.

## Higher Price for Aluminum Expected to Follow Wage Increase

During the third quarter the Government will divert 100,000 tons of primary aluminum, originally intended for the stockpile, to industry. Production in May totalled 131,118 tons a new all time high and for the five months amounted to 632,233 tons. This was a six percent increase over the same period of 1954.

The Commerce Department has ordered a sharp cutback in the amount of aluminum scrap that can be exported abroad in the third quarter, 4000 tons less than in the second quarter. This reflects the tight domestic supply situation.

It is expected that wage negotiations with the union will lead to increases about the same as those granted in the steel industry. In such case a price increase for primary metal and fabricated products will probably follow. Industry leaders have repeatedly asserted that even without a wage increase the aluminum price of 23.2 cents per lb for ingots does not represent an adequate return for invested capital.

# CALENDAR

OF COMING SHOWS AND MEETINGS

- NICE Symposium on Electronics and Automatic Production, San Francisco, Calif. .... Aug. 22-23
- Western Electronic Show and Convention, Civic Auditorium and Fairmont Hotel, San Francisco, Calif. .... Aug. 24-26
- International Ignition Conference, Scintilla Div., Bendix Aviation Corp., Sidney, N. Y. .... Aug. 24-26
- General Motors Powerama, South Lake Shore Drive, Chicago, Ill. .... Aug. 31-Sept. 25
- National Aircraft Show, International Airport, Phila., Pa. .... Sept. 3-5
- AMTDA Annual Meeting, Blackstone Hotel, Chicago, Ill. .... Sept. 5-6
- Farnborough Air Show, England .... Sept. 5-11
- Paris Automobile Show, France .... Sept. 6-16
- NMTBA Machine Tool Show, International Amphitheater, Chicago, Ill. .... Sept. 6-17
- Production Engineering Show, Navy Pier, Chicago, Ill. .... Sept. 6-17
- Coliseum Machinery Show, Chicago, Ill. .... Sept. 6-17
- American Chemical Society, national meeting, Minneapolis, Minn. .... Sept. 11-16
- SAE Golden Anniversary Tractor Meeting and Production Forum, Hotel Schroeder, Milwaukee, Wis. .... Sept. 12-15
- Instrument Society of America, 10th annual Instrument-Automation Conference and Exhibit, Shrine Exposition Hall and Auditorium, Los Angeles, Calif. .... Sept. 12-16
- National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. .... Sept. 14-16
- National Industrial Packaging and Materials Handling Show, Kingsbridge Armory, New York, N. Y. .... Sept. 20-22
- ASME Annual Meeting, Roosevelt Hotel, New Orleans, La. .... Sept. 25-29
- First Trade Fair of the Atomic Industry, Sheraton-Park Hotel, Washington, D. C. .... Sept. 26-30
- AIEE and IRE Industrial Electronics Conference, Engineering Society Auditorium, Detroit, Mich. .... Sept. 28-29
- AIEE National Electronics Conference, Chicago, Ill. .... Oct. 3-7
- AIEE Fall General Meeting, Hotel Morrison, Chicago, Ill. .... Oct. 3-7
- World Plastics Fair and Trade Exposition, National Guard Armory, Los Angeles, Calif. .... Oct. 5-9
- SAE Golden Anniversary Aeronautics Meeting, Production Forum, and Engineering Display, Hotel Statler, Los Angeles, Calif. .... Oct. 11-15
- National Metal Exposition, Convention Hall, Philadelphia, Pa. .... Oct. 17-21
- International Motor Show, Earls Court, London, England .... Oct. 19-29
- AGMA Semi-annual Meeting, Edgewater Beach Hotel, Chicago, Ill. .... Oct. 23-26
- Canadian Industrial Tool and Equipment Show, Montreal, Canada .... Oct. 24-28
- ASME-IME Joint Conference on Combustion, London, England .... Oct. 25-27
- Automobile Old Timers, 16th anniversary dinner Waldorf-Astoria Hotel, New York, N. Y. .... Oct. 28
- SAE Golden Anniversary National Transportation Meeting, Hotel Chase, St. Louis, Mo. .... Oct. 31-Nov. 2

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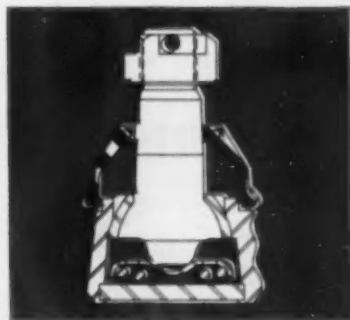
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tive manufacturers have learned they can count on Thompson to develop and manufacture dependable parts. If you use steering linkage units, why not use "Steering Linkage by Thompson". For full details on how Thompson can help you with your steering linkage problems, write, wire or phone Thompson Products, Inc., Michigan Division, 7881 Conant Avenue, Detroit 11, Michigan, WA 1-5010.



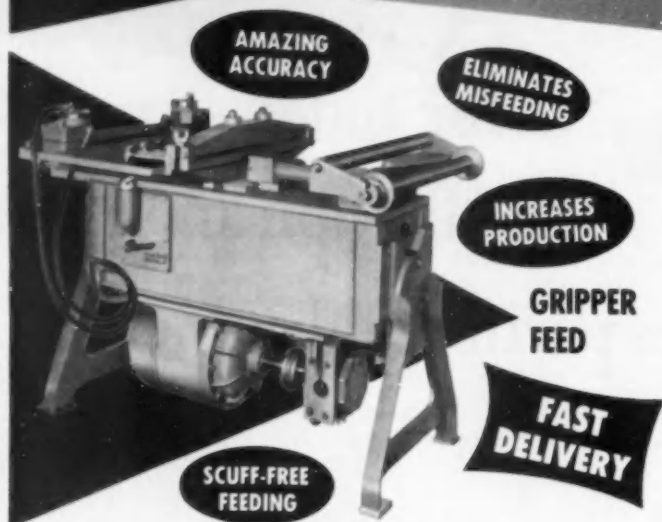
*A Tie Rod End ball stud should fit snug in the socket. Any tie rod end starts that way but the extra bearing surface in the Thompson Dual Bearing tie rod end keeps the stud snug in the socket far longer.*

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## AUTOMATION

### Applied to Heat

(Continued from page 102)

belt type harden and draw lines—all built by Surface Combustion—are all automatically tied into a mechanical cleaning operation by a unique overhead handling system, as shown in Fig. 1.

At the charge end of each furnace line, a recessed floor level hopper and a vertical hinged-flight conveyor provide for automatic furnace charging. This arrangement permits charging of the recessed hopper direct from tote boxes, by the receiving dock overhead crane. Parts are lifted from the hopper by the vertical conveyor and dropped at specified intervals onto the belts of the harden and draw furnace lines. The cycle annealer's trays are also automatically loaded, in sequence, two at a time by the same type of loading arrangement.

The automatic arrangement at the discharge end of each furnace line incorporates a combination of inclined and vertical slat-type hinge conveyors that automatically remove the parts from the cool-down water quench, and deposit them on a system of overhead interchange belt conveyors feeding two mechanical blast type cleaners. All of the furnace lines feed the cleaners interchangeably, or at the same time. After the parts are cleaned, they are sorted and deposited in tote boxes according to type. In this manner four furnace lines automatically feed two mechanical cleaners. Each cleaner has a capacity of as high as 7000 lb per hour.

The direct gas-fired cycle annealer is of the two-row pusher tray type. It isothermally anneals forgings of SAE 8617H, 1117 and 1137 steels at the rate of 2000 lb per hr. A typical 10 hr complete cycle involves heating to 1630-1680 F followed by a fast cool to 1200 F holding at this temperature and a discharge into water heated to 200 F. This latter cool down operation is used on all of the forgings heat treat lines in order to minimize shock of quenching into water and to gain a dry part that is clean of loose scale. The resulting hardness ranges from 4.5 to 5.0 Brinell, depending on the steel.

The direct-fired harden and draw lines are of the continuous conveyor belt type. They are used for hardening forgings of SAE 1140 and 1137 steels using either of two standard

## Treating Equipment

heat treat cycles. Both cycles involve heating to 1580-1630 F followed by a quench into water held at 100-150 F. After the quench the cycle varies. Parts are drawn at either 900-1200 F or 1100-1300 F, depending on requirements. Hardnesses after the draw read about 3.6 to 4.0 Brinell. Capacities of the belt furnaces are as high as 3000 lb per hr, depending on size of part.

The belt furnaces also incorporate the same type of cool-down water quench as used on the cycle annealer. Another unique arrangement on the belt furnaces is an automatic scale remover operating in the quench tank between the harden and draw furnaces. A hair-pin shaped tube, with openings for picking up scale, contains a continuous internal chain with flights. These flights lift accumulated scale from the bottom of the quench tank and deposit it in containers at floor level. Experience has shown that it is necessary to operate the remover only about 16 per cent of the time.

Individual parts requiring heat treating and mechanical forming and other operations are produced on automatic lines that integrate all required pieces of processing equipment, including the heat treat furnaces made by Surface Combustion.

Bearing races require several anneals between deep drawing and machining operations which are followed by gas carburizing and final grinding. The entire operation is automatic with the equipment laid out as shown schematically in Fig. 2. Raw material is press formed, machined, washed, annealed, washed, given a deep draw, washed, annealed the second time, washed, machined, washed, gas carburized, water quenched, tempered cooled down in soluble oil and given a final grind.

Movement between pieces of machinery can be completely automatic and all furnace charging carried out through hoppers equipped with metering devices and charging mechanisms. By building up charges in these hoppers, any variations in flow from machine tools, and other equipment will not interrupt regular flow of parts required to keep the furnaces operating at peak capacity.

Rotating retort controlled atmosphere furnaces are used for the an-



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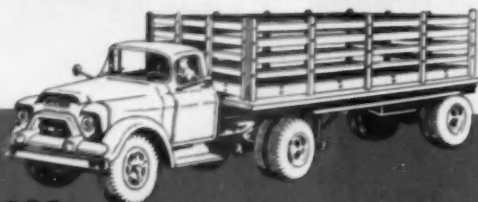
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# AL-FIN

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nealing and carburizing operations. The single retort annealing furnaces are equipped with direct gas-firing burners situated above and below the alloy retort. Only the retort is filled with prepared atmosphere gas.

The double retort carburizing furnace utilizes gas-fired suction type radiant tube heating elements. These tubes are situated above and below the retort. Prepared atmosphere gas in the carburizing furnace not only fills the retort but is also introduced around the retort in the gas tight heating chamber.

An exothermic prepared atmosphere gas is used for surface protection during the annealing operations. The bearing races, produced of SAE 1016 steel, attain a work hardness of about 85-90 Rockwell B after the initial mechanical deep drawing. An anneal at 1350 F reduces this hardness to 50-60 Rockwell B for subsequent forming. The annealing furnaces each have a capacity of up to 400 lb per hr.

The carburizing furnace, utilizing an enriched endothermic generator gas in both retorts, carburizes steel parts to a total case depth of 0.040-0.045 in. after five to six hours' time in the carburizing atmosphere at temperature. Surface carbon concentration averages about 1.00 per cent. After a water quench, the parts are automatically passed through a tempering furnace, also the retort type, heated to 325 F and cooled down in soluble oil. Surface hardness after this tempering operation is usually from 60-63 Rockwell C.

This particular facility is an excellent example of a production line that utilizes dispersed-integration of a number of different furnaces each carrying out a separate heat treat operation. The furnaces are interspersed between numerous machine tools and other processing equipment and the entire facility integrated into a single completely automatic operation.

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# Making Hollow Crankshafts

(Continued from page 63)

are 6 in. long and  $\frac{1}{4}$  in. diam, with ends plugged with tapered pins to prevent ingress of molten metal during pouring. The mold is then carried to the elevating work table of the core blowing machine, the upper half located, and the assembly raised pneumatically against the blow plate.

Cores are hardened by the carbon dioxide process. Clear silicon sand is

wetted with three percent waterglass (sodium silicate), and the mixture is infused with  $\text{CO}_2$  under pressure. When a set of cores is blown the table is dropped and a heavy steel plate is placed on top of the box to press the sand from the blow holes into the core. Carbon dioxide is then injected from below through vents.

The action of the carbon dioxide

on the sodium silicate apparently has the effect of liberating the silicon dioxide which in turn acts as a binding agent on the sand. No baking or drying is needed.

The cover plate and top are removed and the bottom with hardened cores is returned to the central work bench. Meanwhile, the crankshaft drag is made on a pneumatic jolt machine. The pair of brass patterns are cleaned and the box filled with green sand which is packed down. An air hoist raises the box which is then placed on top of the twin core assemblies.

The two boxes are inverted and the core mold lifted off, leaving the cores correctly located in the crankshaft drags and supported by the wires and oil tubes in the appropriate core prints. Oil sand plugs for the fly-wheel ends are inserted. (These are made separately only because the core blower in use has not a large enough span.)

After removal of surplus sand by hand and compressed air, the boxes are aligned on the foundry floor. When a day's run is completed, green sand cokes are made by the same method and the molds are closed. Nodular iron is poured from a ladle on an overhead monorail in batches of ten boxes. Pouring temperature is 2462 F which is below the melting point of the steel oil tubes.

A continuous check is made on the nodular iron by casting two out of every ten crankshafts with an elongation on the pulley end. This is cut off for analysis of microstructure. In addition, serial numbers on the brass patterns are changed for every ten boxes to correspond with individual cupola charges.

When castings are cool, oil tube extensions are cut off with a grinding wheel, and exteriors are cleaned by wire brush and shot blasting. Hollow portions are shot blasted by a worker, suitably garbed in protective clothing, who manipulates the crankshafts before a fixed nozzle. Final operations at Monforts are crack detection, gaging, internal-external visual inspection, and hardness testing.

All machining on the crankshafts is done by Ford at Cologne. Centers are located by dynamic balancing and then drilled on a Carl Schenk machine. Main bearings, counterweights and pulley-end profile are rough turned simultaneously on a Boehringer multi-tool lathe with an off-center driving chuck.

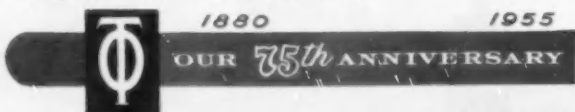
Crank pins are milled on a Heller four-spindle machine in which the four cutter heads (two above and

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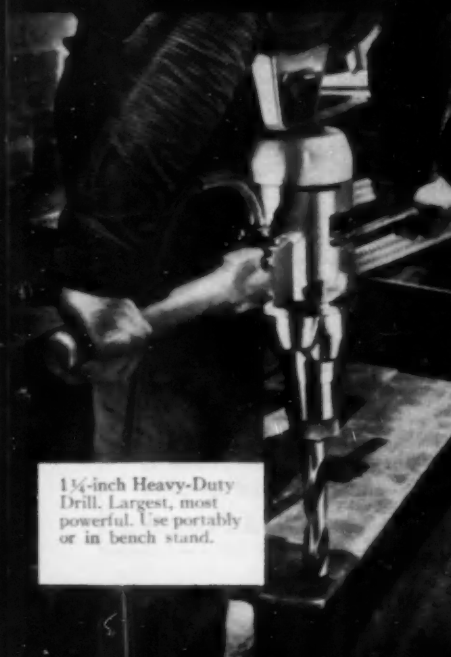
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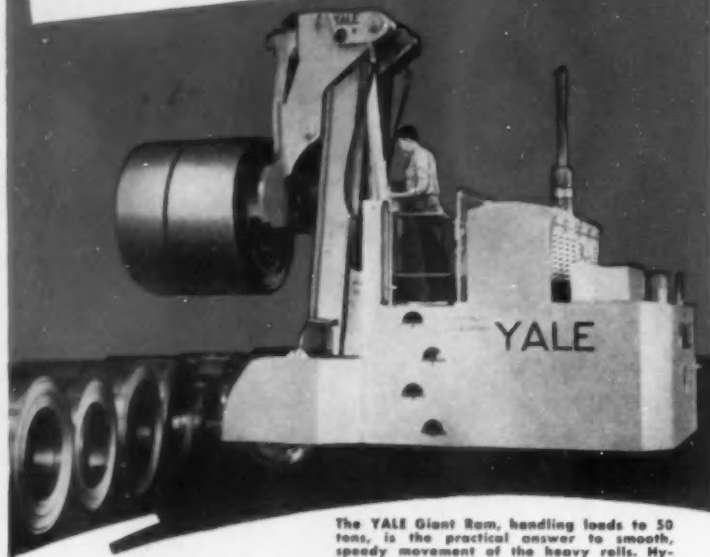


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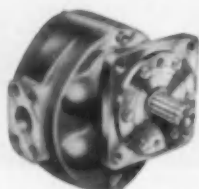
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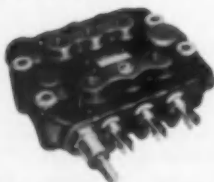


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two below) reciprocate on their vertical slides in unison with the rotating crankshaft. Cutting speed used is 230 fpm and feed 6.3 ipm. Holes on the flywheel mounting flange are drilled, countersunk and tapped on a Hüller four-station multi-spindle vertical automatic. Other operations include end boring and facing, slot milling, and grinding. Finally the crankshaft is balanced on another Schenk machine.

## POWER STATION on Wheels

(Continued from page 61)

ted bronze backed precision type, while thrust bearings are the Kingsbury type. Support is by means of eight threaded rods around the circumference of the bearings, holding the hot parts inside a cold ring. This thermo-elastic mounting results in ease of alignment and uniform frame temperatures.

A single combustion chamber consists of two shells. Primary air flows through the outer annulus to the end of the chamber and enters the inner area where it mixes with the products of combustion. There are three fuel atomizers, and the nozzles may be removed during operation of the turbine. Combustion chamber liner changes are not required during the life of the turbine, according to Clark engineers.

All hot-chamber ducts have inner and outer walls, between which cooling air flows. Water is not required. Air is introduced through openings on the inner diameter of the first stage stator ring and flows over blade roots and supporting disks.

Lubrication is provided by three oil pumps. The main pump is driven by a gear on the compressor shaft, and auxiliary a-c and d-c pumps are also supplied.

The fuel system is designed for No. 2 Diesel fuel oil, but residual fuel oils can be burned with minor changes to the pressure regulators and valving. Gasoline, kerosene or gaseous fuels also may be burned with appropriate changes in fuel nozzles.

## AUTOMOTIVE INDUSTRIES . . .

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**MANUFACTURING**

## Heat Treating Setup Reduces Fire Hazard

(Continued from page 72)

immediately. To eliminate this hazard, the batch furnaces are equipped with a special flow scope. If the atmosphere gas flow falls below a certain established value, the outer vestibule door automatically opens. This also occurs if the dump valve is opened.

To protect the operators against the danger of explosion in the event of failure of the flame curtain that guards against infiltration of air, Ford has specified the installation of two, electrically-ignited pilot lights for each vestibule door. One of the pair is a supervised pilot, fitted with a special safety flame rod which is exposed for visual inspection. If the pilot light goes out for any reason, the electric circuit is so arranged as to lock the vestibule door so it cannot be opened in the usual manner by the operator. It will unlock only after the pilot has been re-ignited and is functioning.

From the standpoint of management, it may be of interest to note that all parts entering the heat treat are first assembled in an area assigned to small parts storage, then put through a large International belt type washer and dried before being scheduled for processing. As indicated above, the work is washed within the heat treating equipment during the cycle. Incidentally, the planet gear pins are given a chemical clean in a Detrex degreaser before induction hardening.

Needless to say, complete control is exercised in this department to assure the proper functioning of equipment as well as policing of the hardened parts. The metallurgical department makes regular inspections of the RX gas atmosphere and has furnace temperatures checked regularly. The two large S-C furnaces are checked twice per shift; while Holcroft pusher furnaces, due to the nature of the cycle, are checked hourly.

In addition, the quality control department makes a sampling inspection on all parts, checking for hardness as well as depth of case. In the case of small, inexpensive parts, samples are cut apart for checking depth of case. On large parts, the procedure usually is to run machine rejects through heat treat, then cut these samples for verifying depth of case for a given run.

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# International Aeronautical Conference

(Continued from page 50)

must be made when the ideas and knowledge furnished by research are integrated into a combustor.

"Low Consumption Turbine Engines"—by A. A. Lombard, chief engineer, Aero Division, Rolls-Royce Limited, Derby, England . . .

There is no aspect of turbine engines more restricted by "security" than that of fuel consumption; this

naturally limits the way in which the subject may be treated. No details of component efficiencies can be stated and fuel consumption can only be referred to in "relative" terms.

It does, however, encourage one particular aspect to be dealt with rather thoroughly—that of the relative importance of specific weight and specific consumption. It is an aspect

which, judged by results, has not received the attention it deserves.

There is clearly a limit to the increase in weight that may be tolerated to achieve a better consumption, eg., by working at higher pressure ratio. An expression is derived for converting specific weight into terms of specific fuel consumption as an aid to determining the optimum engine for any particular aircraft duty.

Progress in the reduction of fuel consumption has largely been made by the introduction of a new engine type, rather than by the progressive development of a given type; this is characteristic of the evolution of any new form of prime mover.

Unless there is a gas turbine configuration that has been overlooked (this is unlikely in view of the effort expended on the problem), further progress in reducing fuel consumption will be by greater engineering refinement.

Within the previous limitations, Mr. Lombard presented a picture of the relative efficiency of various forms of engine over a range of flight speed, followed by a comparison of the high pressure ratio jet and a by-pass engine—each designed with the same skill, for the same duty and with the same assumptions. For the high subsonic cruise speed there is a small but definite advantage in the by-pass engine.

The propeller turbine is placed in the short to medium range application for cruising speeds up to 425 mph. Progress now being made in air-cooled turbine components will result in considerable improvement in performance of the propeller turbine.

"Inlet Duct—Engine Flow Compatibility" — by Joseph S. Alford, mechanical engineer, General Electric Company . . .

Here is a six-point program for improving the compatibility of air induction systems and jet engines:

1. Design of induction systems for good flow distribution.
2. Flow redistributing devices.
3. Design of jet engines to tolerate moderate distortion.
4. Engine controls.
5. Matching of inlet duct flow distortion to engine requirements.
6. Development of accurate engine controls.

In order to obtain the best performance from jet engines designed

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for supersonic flight speeds, the compressor air flow should be as high as possible at intermediate corrected engine speeds.

For example, due to the ram temperature rise of flight Mach 2.0, the engine operating at full mechanical speed will have a corrected speed of only 85 per cent. At this intermediate corrected engine speed, the front stages of the compressor operate at high aerodynamic loadings. Areas of low axial air velocity at the compressor inlet will result in increased angles of incidence of the air on the blading, and will cause stall to occur earlier in these local regions. Since a high air flow capacity is dependent on developing a substantial pressure rise through these early stages, those types of inlet air distortion patterns which reduce the pressure rise through these front stages will directly reduce the air flow capacity and hence the thrust of the engine.

Mr. Alford talked about toleration to various types of inlet flow distortion in the modern jet engine. His investigations include the effects of circumferential distortions having one and two loss areas per revolution, and of radial distortions having loss areas at hub and at tip. For the particular jet engine and inlet flow patterns investigated, radial distortion characterized by low axial inlet velocity at blade tip was found to have the greatest effect on performance at corrected engine speed corresponding to flight at Mach 2.0.

"Power Plants for Supersonic Flight"—by E. S. Moulton, chief engineer, The deHavilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex, England . . .

What about choice and design of power plants for supersonic flight?

The pure rocket and the ramjet have their attractions for special purposes but, without much doubt, Mr. Moulton says, the turbojet is the most likely to become the principal method of propelling manned aircraft at speeds equivalent to Mach 2.0 or 2.5 in the stratosphere. Where duration and range are required, the turbojet will be used by itself; but for maximum performance over shorter durations reheat and/or rocket boost give tremendous gains.

Improved ceiling, higher speeds and greater maneuverability at altitude arise from the use of a rocket in conjunction with a turbojet engine. The problem of the rocket's fuel consumption is not so pronounced if the rocket is used only when it is most appro-



OFTEN

## TWO HEADS ARE BETTER THAN ONE



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Double-heading is only one example of the almost limitless possibilities Hassall cold-heading offers you. If you have a fastener problem just send us samples or specifications for a quotation.

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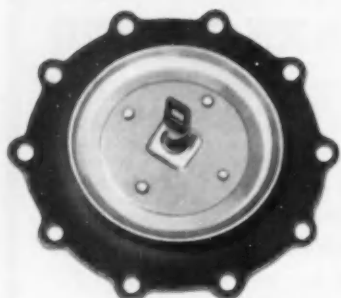


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priate to pour in a lot of power for short periods.

In the design of the turbojet, Mr. Moulton pointed out the vital importance of the air intake and how, at high speeds, its efficiency affects the overall performance of the complete installation. Ram temperature reduces the effective pressure ratio of the compressor itself but this is more than restored by the effects of ram pressure. In fact, a high engine pressure ratio becomes a limitation to output and an embarrassment in design.

At high speeds of flight, raising the combustion temperature has marked advantages in thrust output with only small penalties in specific fuel consumption. This trend, coupled with simplified compressor design, will result in powerful engines of small diameter and light weight per unit of thrust developed.

There are problems in metallurgy and cooling but none appears insuperable; in fact, a solution is already under consideration. The aircraft designer can confidently expect that the power plants required for the next stage in the increasing speed range will be available.

## BOOKS ...

**ANALYSIS OF FEEDBACK CONTROL SYSTEMS**, by Robert A. Brass and Robert M. Saunders, published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. Price, \$7.50. This new book presents a logical, rigorous, and readily understandable treatment of feedback control components and systems. The most recent literature in the field has been surveyed and evaluated in presenting a unified method of analysis consistent with the technical background of those new to the field. The frequency response approach is used throughout. In the 10 chapters devoted to component theory, the basic physical laws governing the behavior of components are interpreted in terms of their transfer functions without the introduction of new mathematical concepts. Components covered are not restricted to any one field, but include electrical, magnetic, mechanical, pneumatic, and hydraulic elements. Recent developments in nonlinear and discontinuous systems, particularly the describing function method, are included.

**ASSURING THE COMPANY'S FUTURE TODAY: CORPORATE MANAGEMENT IN A DYNAMIC ECONOMY**, published by the American Management Association, 330 W. 42nd St., New York 36, N. Y. Price, \$1.75. In this timely report, the presidents and leading executives of nine different companies examine various aspects of company survival and growth in an expanding economy. Among the areas explored in detail are the need for over-all company objectives, the financial foundations of growth, product diversification, market development, and the chief executive's responsibility.

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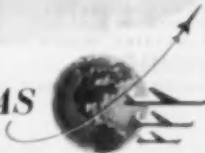
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Enlist to fly with the U. S. Air Force

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First in Aviation

## Early Preparations for the Big Show

(Continued from page 51)

the committee believes, has been satisfactorily solved by preempting a part of the outdoor parking area. This space is to be fenced off to form several score separate storage sections, complete with steel shelves and bins.

A new addition to the International Amphitheatre, the Exposition Hall which was recently completed

practically doubles the floor area available for the Machine Tool Show. It adds 181,000 sq ft of space to the 230,000 sq ft already available. Moreover, because of its location with respect to the main arena, and the additional facilities it makes available for the unloading of machines and equipment received by truck as well as by rail, it has already been found

more than ordinarily useful.

The new area includes a new depressed railroad siding which will accommodate 10 freight cars at a time and a truck dock which will permit five trucks to be unloaded simultaneously. Nevertheless, so pressed is the Show Committee for exhibit space that arrangements have already been made to obtain additional display area by covering over and using for exhibits this sunken rail siding just as soon as all machines arriving in freight cars have been unloaded.

Special concrete footings, placed at intervals between the rails of the 451-ft stretch of track inside the hall, have been so designed as to support stanchions and portable steel framing across which can be laid welded sections of floor plate to cover completely the track well.

The plates, laid flush with the adjoining floor surface, will provide a strong foundation onto which to move machine tools for which no other display space is available.

Exhibits at the Machine Tool Show will be confined entirely to machine tools. Meanwhile, the Production Engineering Show, being held simultaneously on Chicago's Navy Pier will be displaying mechanisms, instruments and equipment that contribute to greater automaticity of industrial production and processing.

Included in this show will be electronic devices, air gauges, conveyors, clutches and drive mechanism, chucks, dies, and jigs, lubricating systems, etc.

Many of the machines will be exhibited at the Machine Tool Show were started on their way to Chicago as early as June first. Hundreds more followed during July—with every effort being exerted to avoid too much of a last-minute peak in August. At the Amphitheatre itself, considerable attention is being given to the fashion in which the exhibits are to be placed in the various halls. Emphasis is being put on the maintenance of a clear, unobstructed view throughout the whole show area so that the machines themselves can be seen to the greatest advantage. To this end, the decorative effects with which individual booths are to be "dressed up" have been limited in height to five feet.

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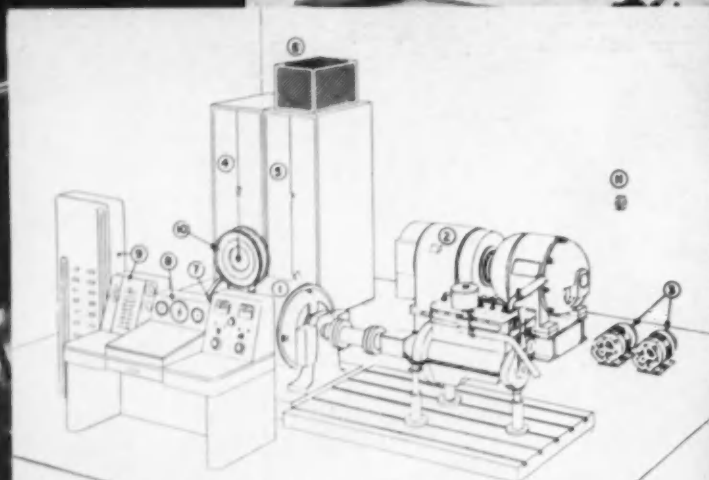
The illustration shows a G-E engineer working with a Ford Motor Company specialist, conducting balancing tests on a G-E dynamometer installed at the dynamometer building of Ford's Research and Engineering Center. Call on G.E. to work with you to develop a system for your specific needs.

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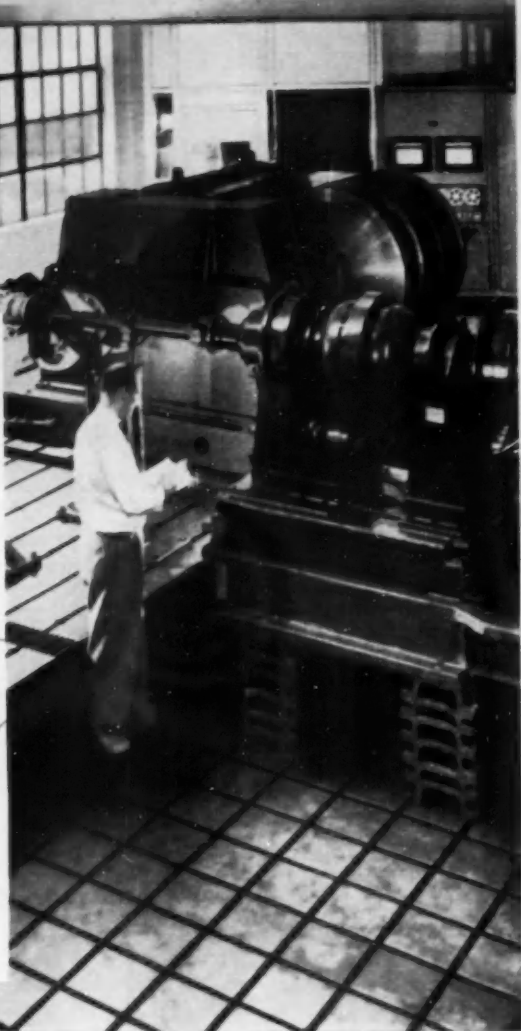


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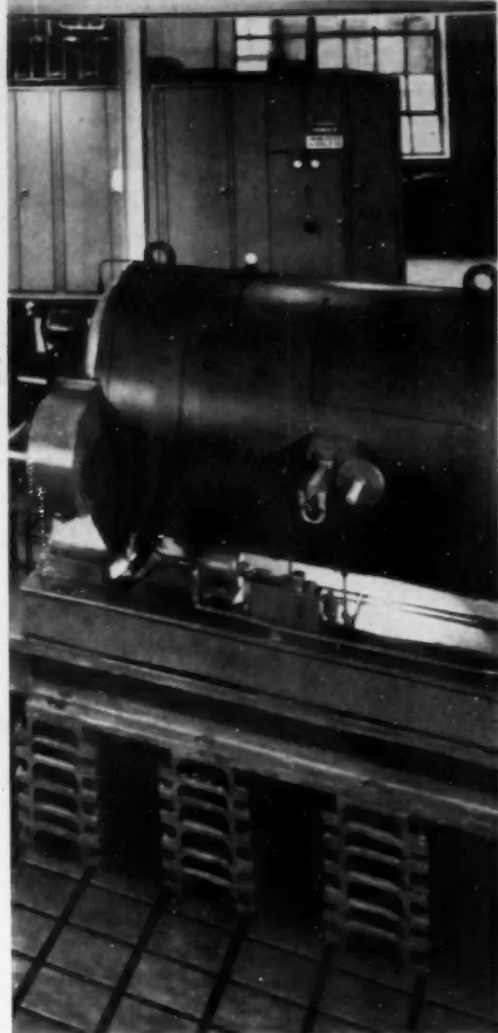
of power, so that machines can be tested from minimum to maximum capacity without the necessity of frequent shutdowns.

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For more information, contact your nearest G-E Apparatus Sales representative, or check coupon for Bulletin GEA-5923A.

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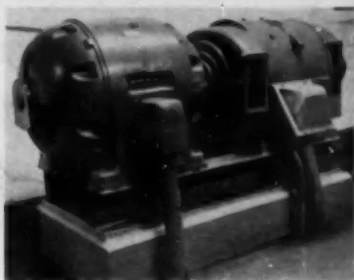
G-E SYSTEM ENGINEERS helped develop this rear axle test stand for the Timken-Detroit Axle Division's Alden Indoor Proving Ground.

# torque range

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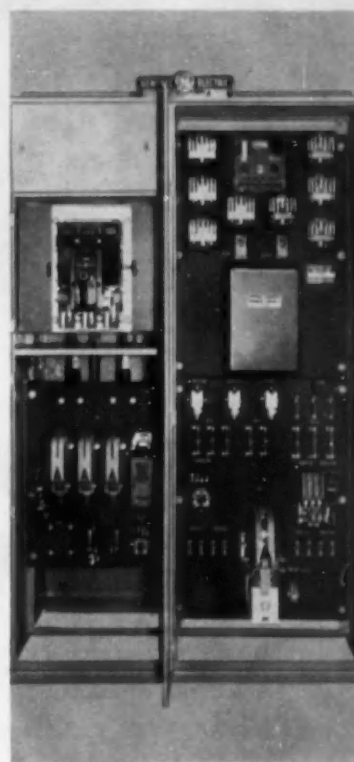


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The illustration shows the starter control for the motor-generator set—lower half of the left panel—with circuit breaker above the contactor.

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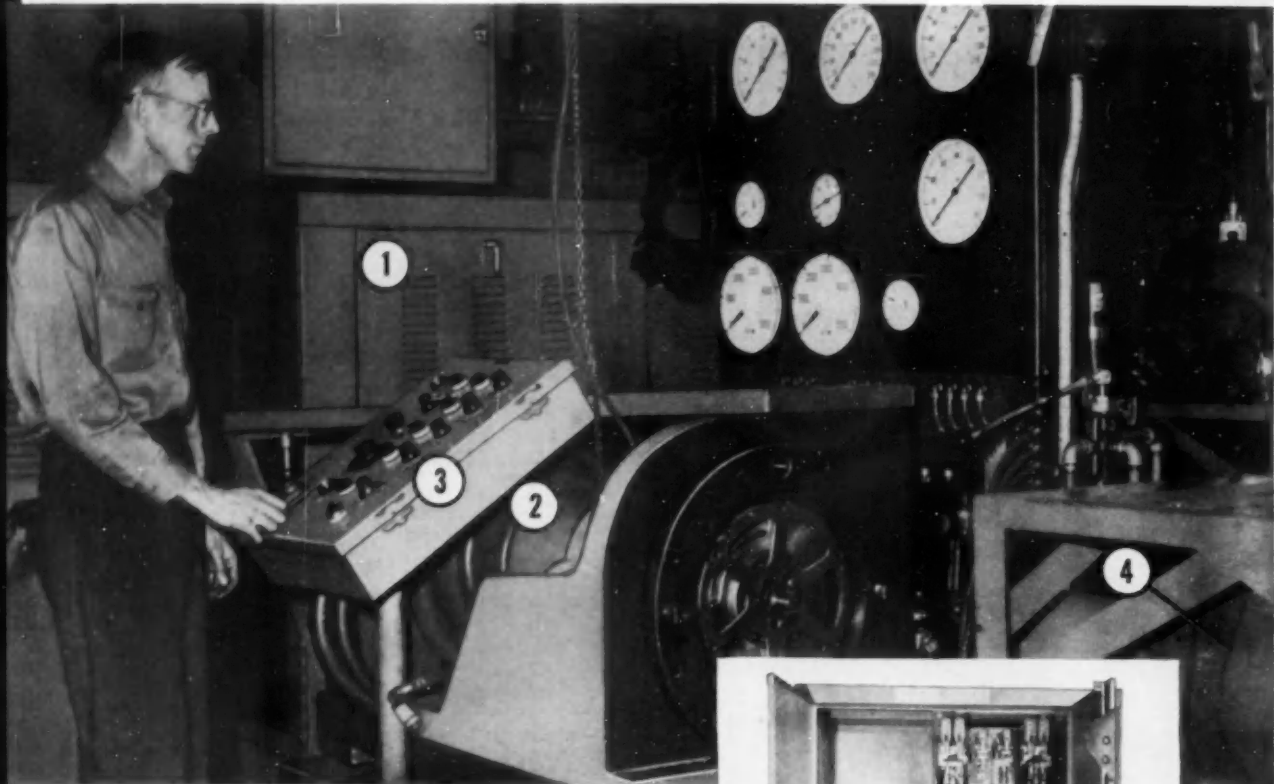
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TURN PAGE FOR MORE PRODUCT HIGHLIGHTS



**G-E JIC SPEED VARIATOR** on test stand of a leading automotive manufacturer. Compact power unit (1) in background, drive motor (2) underneath operator's control (3) and inductor dynamometer (4) lower right.

#### G-E product-engineering reports . . .

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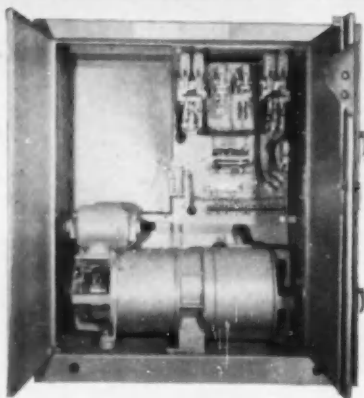
General Electric packaged JIC Speed Variators used to drive machine tools, conveyors and hoists in the automotive industry are also building a reputation for use in automotive component testing.

**WIDE SPEED RANGES**, precise speed regulation, speed of response, low maintenance and easy installation features of this "packaged" drive are ideal for driving transmissions, axles, differentials, etc., on test stands. Its extreme versatility helps you keep pace with new, higher-speed component developments.

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**DC DRIVE MOTOR**, of rugged, totally enclosed construction, provides better protection against dirt, dust and contaminants.



**OPERATOR'S CONTROL** includes push-buttons and rheostat in NEMA 12 enclosure or components may be integrated with master control panel.

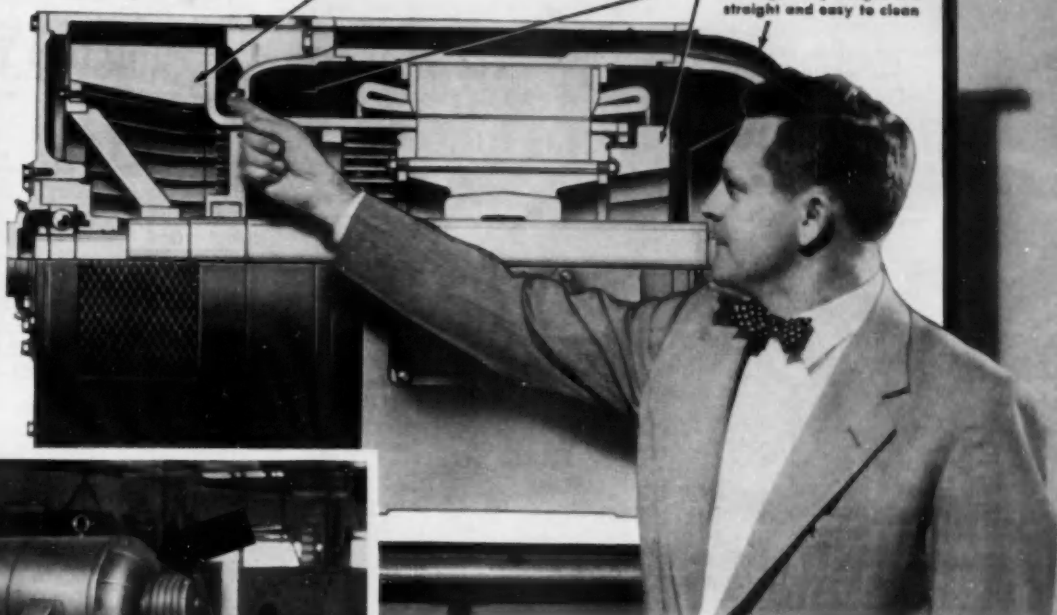
In G-E motors heat develops here . . . . . instead of here

Heat develops in high-resistance radial fan—outside the enclosed stator assembly

Low-resistance rotor bars minimize heating within the sealed electrical part of the motor

Internal fan and baffling facilitate heat transfer

"Straight-through" air flow provides efficient cooling; air passages are straight and easy to clean



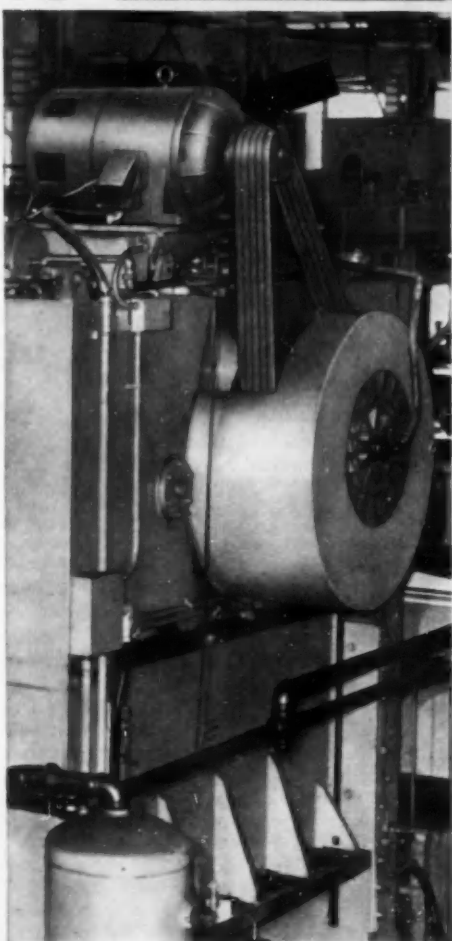
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For complete details, write for Bulletin GEA-5968.



Rugged, cast-iron frame and rigidly bolted end shields of the G-E Type KRX motor provide totally enclosed protection for your heavy-duty applications.

GENERAL  ELECTRIC

## Diesel Compressor

(Continued from page 68)

effect, while flanges on the engine pistons drive the scavenging pump by the air pressure developed.

Scavenging air pressure is built up in receivers which also serve as the rocker arm covers. Supercharging is stated to be as high as 72 psi. The piston stroke varies from 4.29 in. at idling speed to 5.55 in. at full load, and adjusts itself automatically to the given pressure requirements.

Air cooling is by turbo-blower driven by exhaust gases, with the forced draft ducted past the finned cylinders from the common space between them. All bearings are of the roller needle type with pressure lubrication. The fuel pump is driven from one of the rocker arm pivot shafts.

The Freiflug unit, weighing about 1000 lb without its base, is designed for easy access of parts and simple maintenance. All valves are standardized and can be reached from outside. Engine and compressor pistons are identical; can therefore be periodically interchanged to equalize wear.



Defense Dept. will have \$31.8 billion in new money to spend for goods and services in the new fiscal year. Final version of the defense money bill as whipped out by Congress included \$100 million for machine tool purchases, \$356 million for the new B-32 intercontinental bomber, and \$1.3 billion for research and development work.

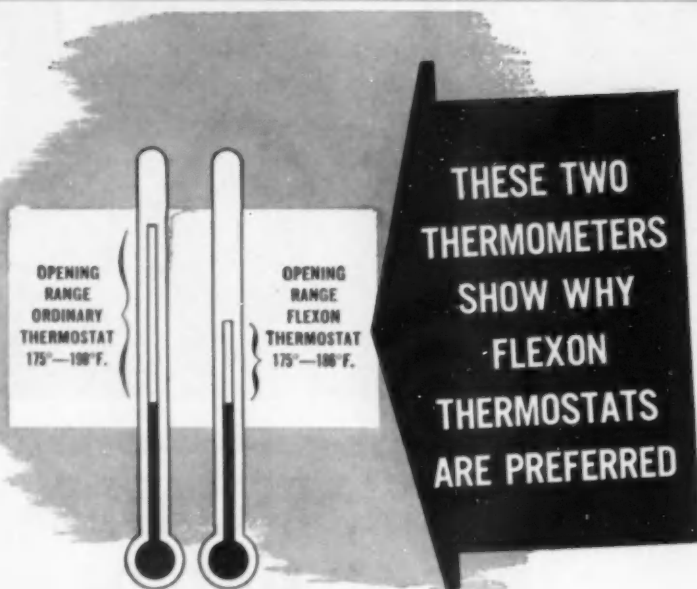
Labor Dept. says it will advise state governments whether to permit unemployed workers to draw both guaranteed-wage payments and unemployment compensation.

Industry task groups are assisting the Defense Dept. this summer by analyzing proposed standard performance specifications for industrial power trucks to be bought by the military.

Led by the metalworking industries, the nation's factories are producing and selling a record volume of goods this year. A mid-year tally taken by the Dept. of Commerce discloses that almost all industries will chalk up new all-time high production and sales records in 1955.

Defense Dept. has adopted a tough new policy on the release of military information.

Companies preparing their products for export can buy from the Government new publications describing necessary shipping documents, labeling and packing requirements, and customs procedures applicable to more than a dozen countries. Reports are entitled Preparing Shipments to —, and they are sold at 10¢ each by Commerce Dept. field offices and the Superintendent of Documents, Government Printing Office, Washington 25, D. C.



Flexon Thermostats go from full closed to full open in a range of only eleven degrees of temperature! Contrast this with the conventional thermostat's operating range of about twenty-three degrees and you'll see why Flexon Thermostats provide more uniform motor temperature and more efficient cooling system operation.

A new type of charge for the bellows, developed by Flexonics, makes this performance possible. While the conventional charge of alcohol and water exerts only vapor pressure, the new Flexon charge augments vapor

pressure with gas pressure.

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A further advantage is that in the rare event of failure, the Flexon Thermostat opens permitting continued operation of the car until the thermostat can be replaced.

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Flexon identifies products of Flexonics Corporation that have served industry for over 35 years.



## Single Purpose Plant for Ball Joints

(Continued from page 65)

cycle. Loading and unloading are manual, two pieces being loaded at each fixture station. Progressively the machine roughs and finishes the cavity, faces, chamfers, and spot faces.

The forging then goes to a vertical Colonial broaching machine in which the oval-shaped throat at the spherical section is finished to size in one pass. The machine is fitted with three stations and finishes three pieces at a time, using pull-down broaches.

Following this the socket is presented to another large six-station Hartford Special machine for drilling three flange holes, and drilling and tapping the oil fitting hole in the side. Because the flange holes run approximately 1 1/4-in. deep, drilling is done in two stages — first, part way through, then through. Here, too, loading and unloading are manual, two pieces at each fixture station.

Studs are fabricated from cold headed blanks. The head of the stud is spherical, held accurately to limits of 0.593 - 0.595 in. on the radius. This operation is performed in a battery of National Acme Gridley automatic screw machines. An interesting feature of the setup is the provision of magazine loading.

Since the studs are required in enormous quantities, T-P installed a unique four-station Rehnberg-Jacobson special machine for drilling and chamfering the cotter pin hole and sawing the slot in the threaded end. It is arranged to handle four studs at a time in the fixture. This one machine takes the place of a large number of the usual general purpose machines and has sufficient productivity to handle the entire program.

Final assembly of ball joints is prepared in special rotary indexing type assembly machines specifically designed for this operation. It makes for an extremely compact operation, requiring the minimum of operators, with many functions performed automatically.

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We have just printed a list of Hercules Distributors and Dealers. There are over 550 Hercules Service Outlets listed. 241 of these outlets are located throughout the United States and the remainder are export outlets which make up our world-wide service organization.

If you operate your Hercules Engines in different regions of the country, you will want a copy of this booklet with each piece of Hercules powered equipment. We will be happy to send you a copy of "The Hercules Distributor and Dealer List" if you will write us on your letterhead.



## HERCULES ENGINES

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## Automatic Arc Welding of Tractor Components

(Continued from page 67)

all being supported on a lower ram that is retracted and at table loading height. Next, two carriages move in, one from each side, to do side clamping and the top clamp is then lowered mechanically, clamping both top and bottom plates between the lower ram and a bridge that has been lowered by hand wheels moving screws, and presses the top and bottom against the edges of side plates which are pressed inwardly by the side carriages.

In doing this clamping, "shelves" that support the flux are moved inwardly from the sides to such a position that the flux, deposited on the shelves, will cover the arcs. Heads are moved into welding position at the same time that clamping is done. Just before the wire, fed in through each head, contacts the work, flux feed starts automatically and, as soon as the arcs strike, the heads start their traverse and lay down the weld beads covered by flux.

All four heads move forward simultaneously at a speed of 30 ipm, and four weld beads are laid down simultaneously as the heads advance. When the four beads are completed, the heads are retracted by their supports, the lower ram retracts and the weldment, now completed, is in position for removal and is withdrawn onto the table, as in Fig. 3.

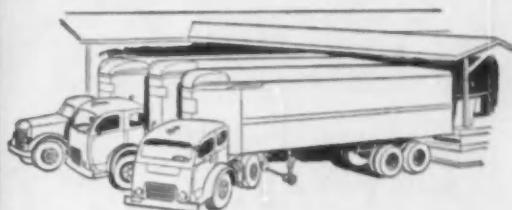
While welds are being made, a vacuum pickup at the rear of the machine and operated by an automatic timer sucks flux back into an upper separator. Flux returned to the system is cleaned and then is returned to the lower flux hoppers for reuse. Much of the fused flux remaining on welds drops off as the welds cool, and any that remains is easily brushed off subsequently. All weld spatter is avoided by the flux, hence, there is none to be cleaned from the weldments.

### GE Is Awarded New Contract For Aircraft Radar Armaments

A \$6 million contract for production of remote-controlled radar armament systems for Air Force B-47 stratojet bombers has been awarded to General Electric Co. The contract brings to more than \$28 million the amount that GE has been granted for the aircraft units since 1953.



Roy Fruehauf, President, Fruehauf Trailer Company



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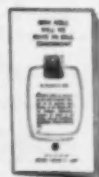
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## BUICK'S Automatic Gear Processing

(Continued from page 56)

jectionable noise. One machine has been equipped with this device to determine the course of future action. Any limiting noise pattern may reject many gears that are actually acceptable. It turns out that although acoustic inspection is extremely sensitive, its rate of checking is so fast by comparison with the human ear that it pays to accept even a sizeable percentage of rejects

and later to reinspect with an operator so as to salvage the usable gears.

Finally, it may be noted that although each machine in the line is provided with its own Syntrol, in the majority of cases the Lamb Stomat, storage type, conveyor units are expected to handle and meter the flow of work. The Syntrol units, on the other hand, eventually will

serve as insurance against breakdown in the system where they are not required for the primary distribution task.

The pinion in question has a finished OD of 1.0770-1.0740 in., with faces ground to a width of 0.624-0.622 in., the faces being held square with the bore to a total indicator reading of 0.002 in. The honed bore is held concentric with the pitch circle within 0.002 in. total indicator reading, surface finish being specified as 10-microinches, maximum.

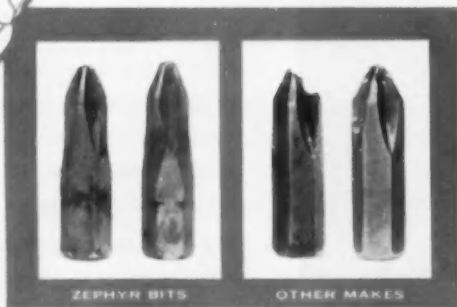
Principal gear data are as follows: 16 teeth; normal DP—18; helix angle 18 deg. 30 sec.; normal pressure angle—20 deg.; whole depth—0.1300 in. Maximum allowable spacing error on circular pitch—0.0002 in. The shaving operation is one of crown shaving with limits of 0.0002-0.0004 in.

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## News of the MACHINERY INDUSTRIES

(Continued from page 79)

The new cutting tool, under development since 1951, according to Carboly, is made entirely of inexpensive materials, a factor which may possibly help lower tooling costs. Carboly engineers point out, however, that the new laboratory-developed material is brittle, more susceptible to cracking than carbides and has properties which must be thoroughly understood by the tool designer to take advantage of its capabilities.

Engineers of the G-E Department also pointed out that if the new tool material can be successfully field tested after leaving the laboratory, it may improve upon current finishing ranges in machining. They also feel it will supplement carbides, much in the same way carbides supplemented high speed cutting tools about 15 years ago.

Several machine tool builders plan to demonstrate the experimental cemented oxide-base material on their new high-speed machines during the giant national machine tool show in Chicago, early this September.

## AUTOMOTIVE INDUSTRIES...

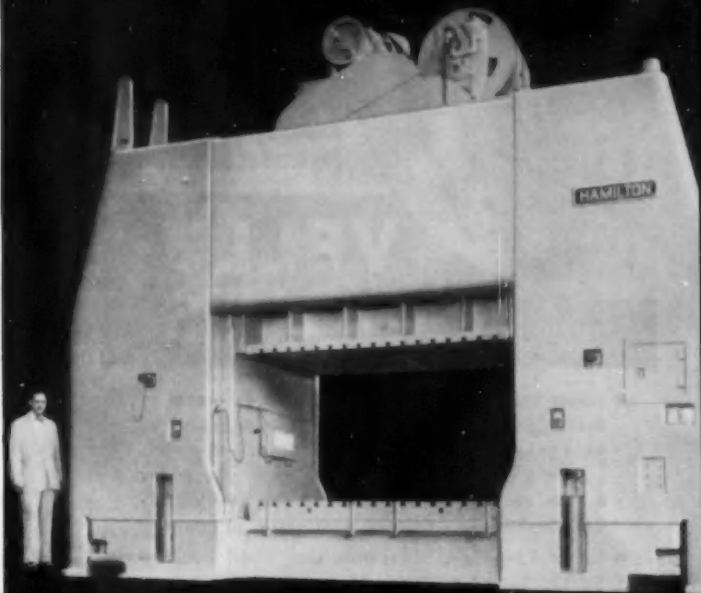
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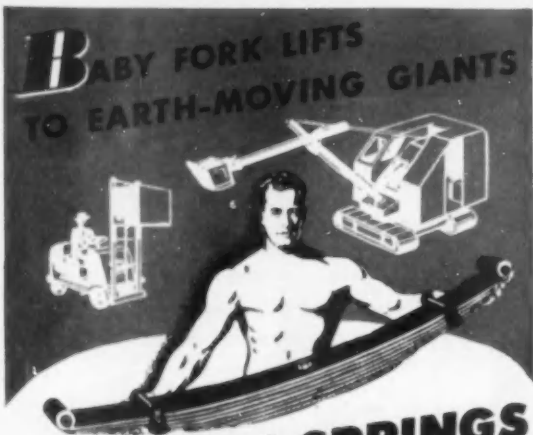
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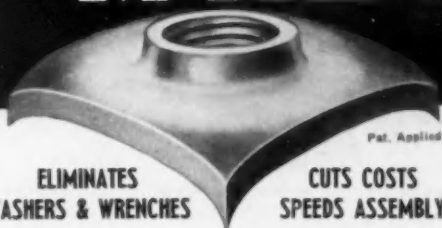


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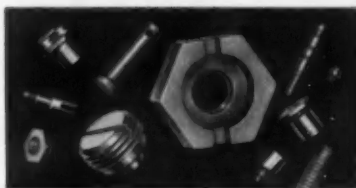
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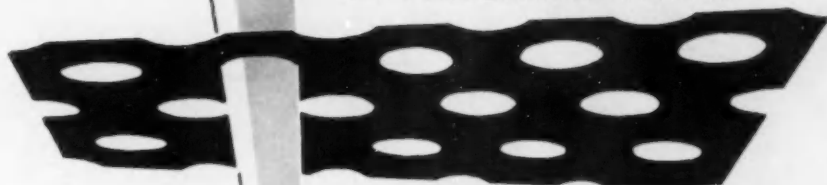
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JOSEPH P. SPANG JR.

Portrait by Fabian Bachrach

## "A majority of the employees at Gillette..."

"The United States Savings Bonds program is good for the personal security of the bond buyer—good for the security and economy of the Country. A majority of the employees at Gillette Safety Razor Company purchase Savings Bonds the payroll savings way. Under this plan they find it easy to save a tidy sum for retirement years, to pay that unexpected bill, or meet the expense of other emergencies that arise."

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## Sensational Piston Performance

# UNIFORM CLEARANCE AT ALL TEMPERATURES

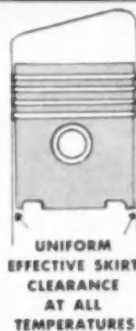
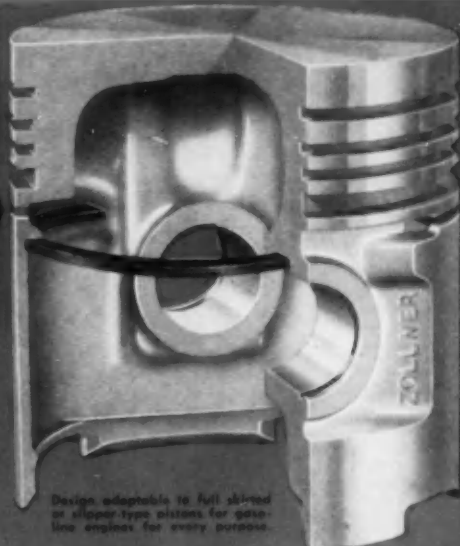
### STEEL TENSION MEMBER

Anchored only at pin bosses  
and cast in positive contact  
with I. D. of piston skirt

Controls Clearance Automatically

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**CLEAR O MATIC**  
**PISTONS**

Now, pistons may be fitted to closer clearances than ever before possible. The sensational development of CLEAR-O-MATIC Pistons by Zollner engineers reduces required clearance to less than .001 with constant uniformity of skirt bearing over the entire temperature range. Performance results are spectacular. Engines run quietly with no cold slap. Friction is reduced without loss of durability or heat conductivity. There is no danger of scuffing or seizing. The Zollner designed steel tension member incorporates in the aluminum piston the same effective expansion as the ferrous cylinder itself. We urge your immediate test of these sensational advantages for your engine.



- 1 Clearance maintained uniformly at all coolant temperatures from 20° below zero to 200° F.
- 2 Effective expansion identical with ferrous cylinder.
- 3 Steel tension member, with same effective expansion as cylinder, maintains uniform skirt clearance through entire temperature range.
- 4 Normal diametric clearance usually less than .001 with uniform skirt bearing.
- 5 Durability and conductivity comparable to heavy duty design.

**ZOLLNER**

**THE ORIGINAL EQUIPMENT PISTONS**

**PISTONS**

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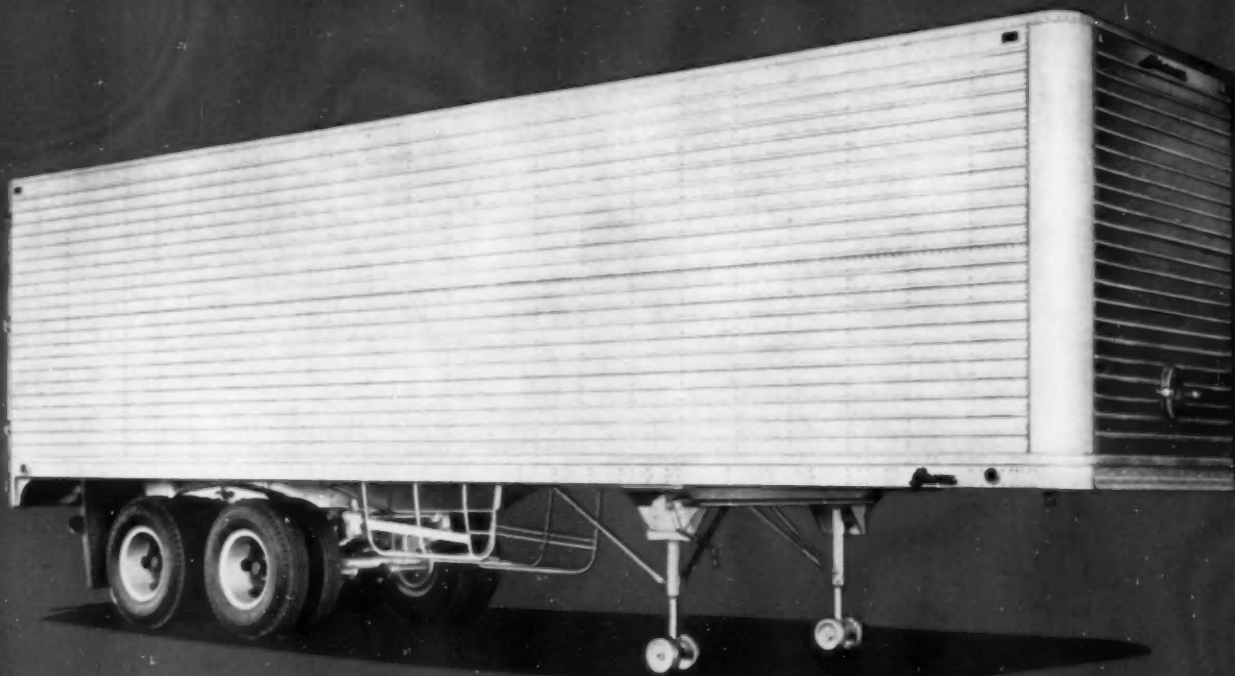
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